Engineering Library

AUTOMOTIVE INDUSTRIES

LAND — AIR — WATER

MAR 18 1940

MARCH 15, 1940

Miles of Smiles
The great majority of the magnificent American streamliners and new locomotives roll on Timken Tapered Roller Bearings. ¶ These roller bearings were specified by railroad executives because of Timken's undisputed efficiency, Timken's advanced engineering and research, Timken's greater comfort-providing factors and Timken's ability to increase locomotive availability. Hence: Miles of Smiles for everyone! ¶ Travel on a Timken Bearing Equipped train and enjoy the best rest of your life!
NOTICE
Look for the trade-mark TIMKEN on every bearing, whether buying new equipment, or replacing a Timken Bearing in your automobile or truck, industrial or farm machinery. That trade-mark is your assurance of quality.
TIMKEN BEARING EQUIPPED
TIMKEN
TAPERED ROLLER BEARINGS
THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO

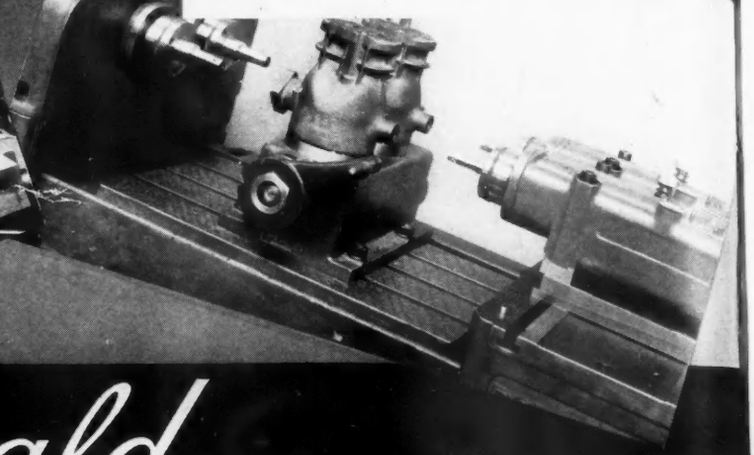
This advertisement appeared in The Saturday Evening Post, February 24th and in other leading publications. Miles of Smiles for every manufacturer and user of Timken Bearing Equipped automobiles.

22,000 HOURS SERVICE

from these Boring heads running 24 hours a day turning taper on refrigerator valve needles

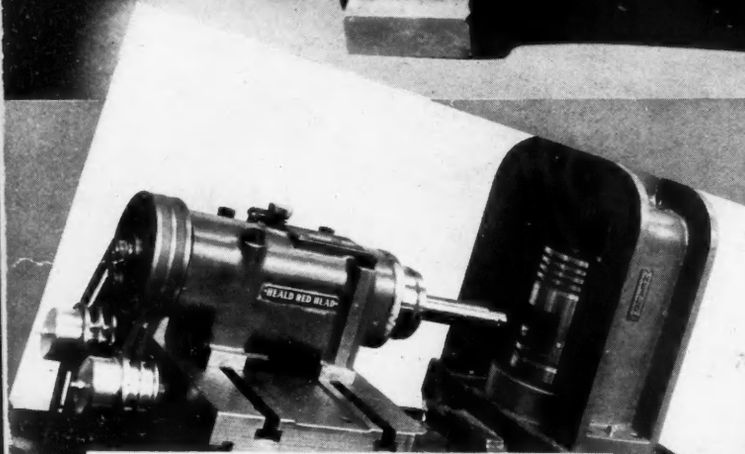
FOR 6½ YEARS

These Boring heads have bored refrigerator cylinders without having been off the machine



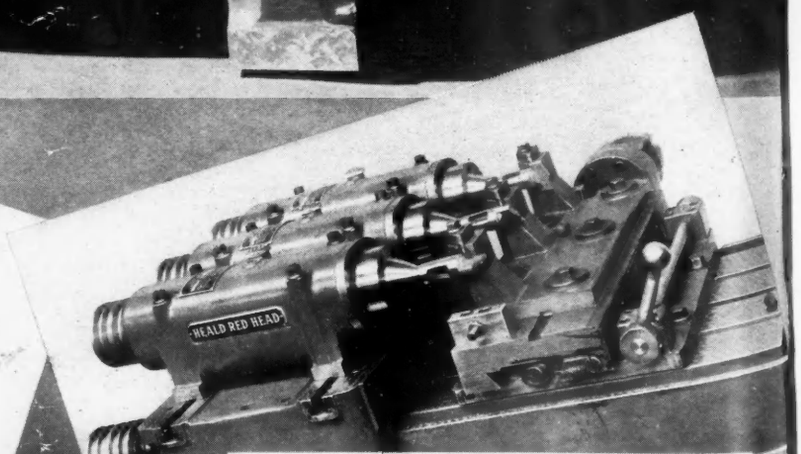
Heald

LONG LIFE RED HEAD BORING UNITS



This Boring head has borized the wrist pin holes in pistons

FOR 4 YEARS



Of these three heads turning valve cocks not a single head has been down for repairs not even to change a bearing

IN 5½ YEARS

THE HEALD MACHINE COMPANY

WORCESTER, MASS., U.S.A.

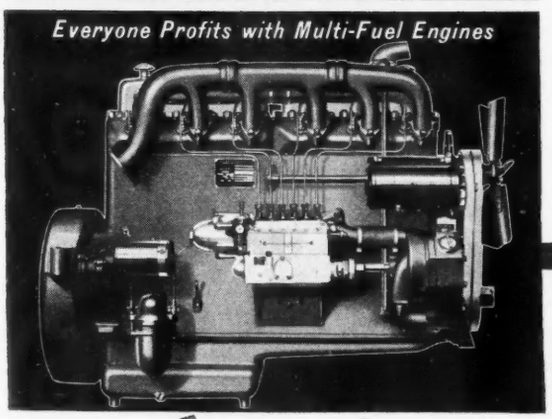
MULTI-FUEL ENGINE SAVINGS PUT US RIGHT ON TOP

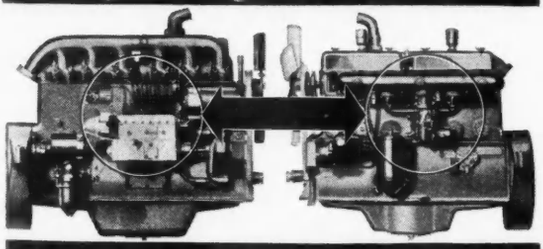
Said the President

"Our adoption of Waukesha *Multi-Fuel* Engines has meant more profits—through simplification of our entire line of power equipment—and savings in designing, producing, selling and servicing.

"This puts us in a most strategic position. Our competitors must carry expensive inventories of special parts to meet the small demand for diesel oil engines. Our single power plant—the *Multi-Fuel* Engine—gives us flexibility to meet the demand for oil engines as it grows.

"Practically a universal engine, the *Multi-Fuel* satisfies every engine requirement of our customers. It burns diesel oil, gasoline, butane, or natural gas *without internal changes.* Conversion . . . a matter of fuel accessories only . . . is done in our own shops and takes less than an hour." *Write for Bulletin 1173.*





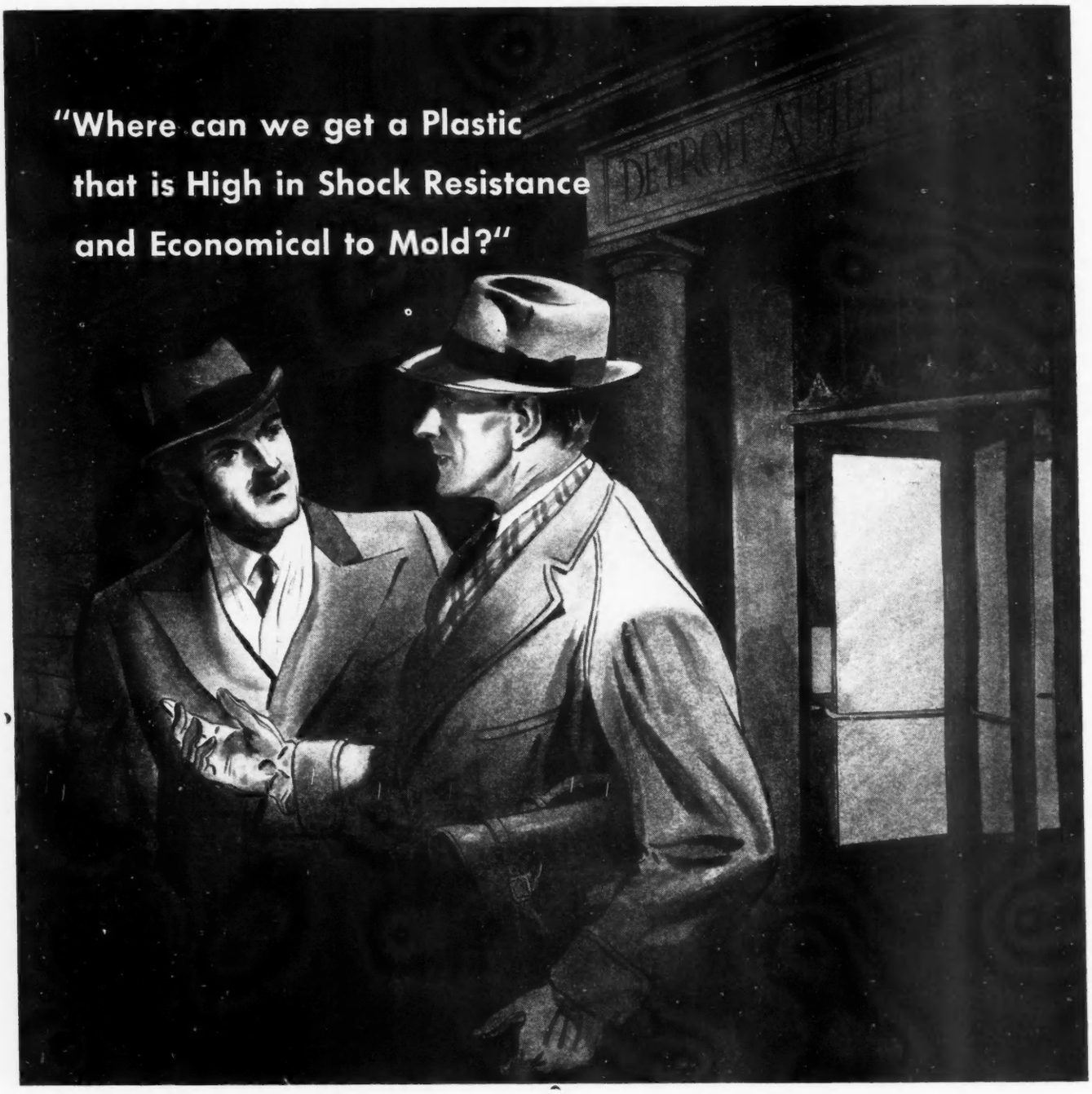
From OIL to GASOLINE in 20 MINUTES

WAUKESHA MOTOR COMPANY, WAUKESHA, WISCONSIN

NEW YORK TULSA LOS ANGELES

This Advertisement is No. 1 of a Series.

WAUKESHA *Multi-Fuel* ENGINES



AUTOMOTIVE engineers and designers confronted with the problem of obtaining plastics that are highly resistant to impact, yet are economical to mold, will find the answer at Bakelite Plastics Headquarters. There, due consideration will be given to the numerous factors that must be carefully weighed, such as molding technic; curing time; preformability; specific gravity; cost of molding material; physical, electrical and chemical characteristics.

For example, *thermo-plastic* Bakelite Cellulose-Acetates, molded by the injection process, offer shock resistance, plus gem-like colors and high surface lustre. *Thermo-setting* impact resistant Bakelite Phenolics, fabricated by compression molding, offer varying degrees of toughness in dark, opaque shades.

Advice on the correct material to use is an important phase of the engineering service offered by Bakelite Plastics Headquarters. Here you will find, in addition to shock resistant Phenolics and Acetates, hundreds of different materials, including Ureas and Polystyrenes. These plastics afford unlimited color-styling possibilities as well as a diversity of other properties for varied automotive needs. For further information, write for Booklet 10P, "New Paths to Profits", and copy of the "Plastics Comparator", including tables of relative values for various types of molding materials.

BAKELITE CORPORATION, 247 Park Avenue, New York
Unit of Union Carbide UCC *and Carbon Corporation*

BAKELITE

The registered trade marks shown above distinguish materials manufactured by Bakelite Corporation. Under the symbol 'B' a wide numerical age for adults, or unlimited quantity. It symbolizes the reliable number of present and future uses of Bakelite Corporation's products.

PLASTICS HEADQUARTERS

AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

Reg. U. S. Pat. Off.
Published Semi-Monthly

Volume 82 Number 6

JULIAN CHASE, Directing Editor
HERBERT HOSKING, Editor
P. M. HELDT, Engineering Editor J. B. POLLOCK, Ass't Editor
JOS. GESCHELIN, Detroit Technical Editor MARCUS AINSWORTH, Statistician
J. A. LAANSMA, Detroit News Editor HOWARD KOHLBRENNER, Art Editor
JEROME H. FARRIS, Ass't Editor L. W. MOFFETT, Washington Editor
H. E. BLANK, JR., Ass't Editor JAMES G. ELLIS, Washington Editor
B. M. IKERT, Chicago Technical Editor

CONTENTS

Dealers Seek March Millennium. *By Herbert Hosking* ... 265
Business in Brief ... 267
Britain Favors High Octane Fuels for Aircraft ... 268
Testing Equipment Feeds Progress at Hayes Industries ... 272
New Developments in Automotive Materials 274
Building Integral Body and Chassis. *By M. W. Bourdon* ... 278
Men and Machines ... 280
Production Lines ... 284
Engineering Drawings of Buick Front and Rear Suspensions ... 285
Just Among Ourselves ... 287
Hydrodynamic Power Transmission Units 288
Coatings for Piston Rings ... 288
A New Dynamic Vibration Damper for Crankshafts ... 289
Specifications of American Wheel and Track Laying Types of Tractors ... 290
News of the Industry ... 293
Advertisers' Index ... 59

Copyright 1940 by Chilton Company (Inc.)

Jos. S. HILDRETH, President and Manager Automotive Division; G. C. BUZBY, Vice-Pres.

OFFICES

Philadelphia—Chestnut & 56th Sts., Phone Sherwood 1424
New York—239 W. 39th St., Phone Pennsylvania 6-1100. Chicago—Room 916 London Guarantee & Accident Bldg., Phone Franklin 4243. Detroit—1015 Stephenson Bldg., Phone Madison 2090. Cleveland—609 Guardian Bldg., Phone Cherry 4188. Washington—1061 National Press Bldg., Phone District 6877, San Francisco—444 Market St., Room 305, Phone Garfield 6788. Los Angeles—6000 Miramonte Blvd., Phone Lafayette 5525. Long Beach, Cal.—1595 Pacific Ave., Phone Long Beach 613-238.
Cable Address.....Autoland, Philadelphia

Member of the Audit Bureau of Circulations
Member Associated Business Papers, Inc.

Automotive Industries—The Automobile is a consolidation of the Automobile (monthly) and the Motor Review (weekly), May, 1902; Dealer and Repairman (monthly), October, 1903, the Automobile Magazine (monthly), July, 1907, and the Horseless Age (weekly), founded in 1895, May, 1918.

Owned and Published by
CHILTON COMPANY
(Incorporated)

Executive Offices
Chestnut and 56th Streets, Philadelphia, Pa., U. S. A.

Officers and Directors
C. A. MUSSELMAN, *President*
Vice-Presidents
JOS. S. HILDRETH GEORGE H. GRIFFITHS
EVERIT B. TERHUNE J. H. VAN DEVENTER
C. S. BAUR
WILLIAM A. BARBER, *Treasurer* JOHN BLAIR MOFFETT, *Secretary*
JULIAN CHASE THOMAS L. KANE G. C. BUZBY
P. M. FAHRENDORF HARRY V. DUFFY

"PAUL PRY" *learns*

1940 MODELS TURN TO BORGLITE DRIVEN PLATE FOR SHIFTING EASE . . .

● It clicked in the '39 cars—it's much more popular in those 1940 models that have joined the industry-wide swing to steering-post gear shifts. An increased demand for the new driven plate that helped make the new style shifting so easy and practical is a most logical deduction, says Paul Pry, the industry's improvement detective—and he's right! Try it and see.

THE BORG & BECK CLUTCH *with* BORGLITE DRIVEN PLATE

1. Cover plate better ventilated, designed for life-long even contact with the plate.
2. New, lighter Borglite driven plate for "finger touch" gear shifting.
3. Waved "clock-spring" steel cushion segments, tailor made to bring facings into full contact.
4. Light weight at outside edge cuts spinning time, results in faster, easier and quieter gear changing.

BORG & BECK
DIVISION
BORG-WARNER CORPORATION
CHICAGO, ILLINOIS

AUTOMOTIVE INDUSTRIES. Vol. 82, No. 6. Published semi-monthly by Chilton Co., Chestnut & 56th Sts., Phila. Entered as Second-Class Matter October 1, 1925, at the Post Office at Philadelphia, Pa.; Under the Act of Congress of March 3, 1879. In Case of Non-Delivery Return Postage Guaranteed. Subscription price: United States, Mexico, United States Possessions, and all Latin-American countries, $1.00 per year. Canadian and Foreign, $2.00 per year; single copies, 25 cents, except Statistical Issue (Mar. 1, 1940), 50 cents.

Most of the Leading Manufacturers In the Automotive Field Come to CHILTON with DIRECT MAIL ADVERTISING

We now function as their mailing department because they realize that they can reach the most clearly defined field at the lowest cost per verified name. Let their results be your safest guide. Rely upon the Chilton Direct Mail Service for sending your sales message.

CHILTON AUTOMOTIVE LISTS

Contain Nearly 150,000 Names And Are Corrected Daily

Over 35,000 Names dropped and added each year.
Over 50,000 Names and Addresses changed each year.

CHILTON DIRECT MAIL ADVERTISING COSTS YOU LESS *Because*

1 There is no duplication of names.
2 All names are checked and cross-checked.
3 Verification is by personal interview.
4 Changes are made daily.
5 Undeliverable returns are negligible.
6 Chilton selectivity permits concentration on clearly defined field.
7 Chilton efficiency permits moderate prices.

A force of more than 100 persons is maintained to keep the Chilton List up to the minute. The Chilton List—with more than 100,000 changes each year—is the outstanding leader in the field.

Mechanical equipment makes any selection to suit your needs, while complete printing, multigraphing, binding and creative art and copy service, as well as merchandising counsel of our representative in your territory, are available.

You will find a distinct saving in addressing Car and Truck Dealers, Independent Repairshops, Automotive Wholesalers or Truck Fleet Operators from the Chilton List. Write us for complete details as applied to your particular requirements.

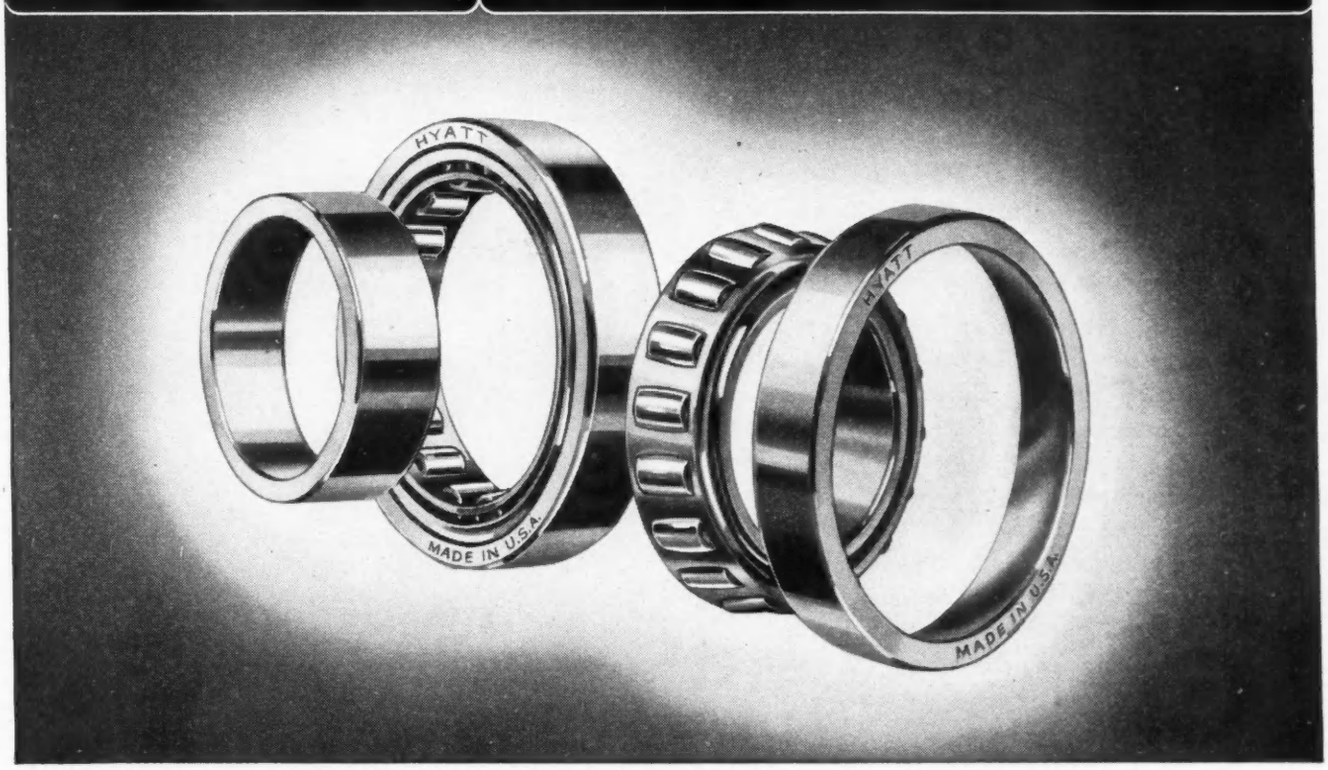
Direct Mail Division

CHILTON COMPANY

Chestnut and 56th Streets **Philadelphia, Penna.**

For RADIAL Loads

For Combination RADIAL AND THRUST Loads



ABILITY TO HANDLE the double assault of thrust and radial loads . . . added to advantages in design and application that for years have placed millions of Hyatt Quiet Roller Bearings in important car, truck and bus positions . . . is helping automotive manufacturers achieve new standards of performance. Naturally, then, an important factor in the continued and steadily increasing use of Hyatts is reflected in the quieter, smoother, carefree bearing performance . . . performance that car builders are able to pass on to car owners.

Hyatt Bearings Division, General Motors Sales Corp., Harrison, N.J., and Detroit, Mich.

HYATT

ROLLER BEARINGS

QUIET

Again—100% inspection —automatically

• Another step in the attainment of highest possible standards of precision manufacture is a new machine now in operation at the Ford Rouge plant that automatically inspects 300 crankshafts per hour in regular production.

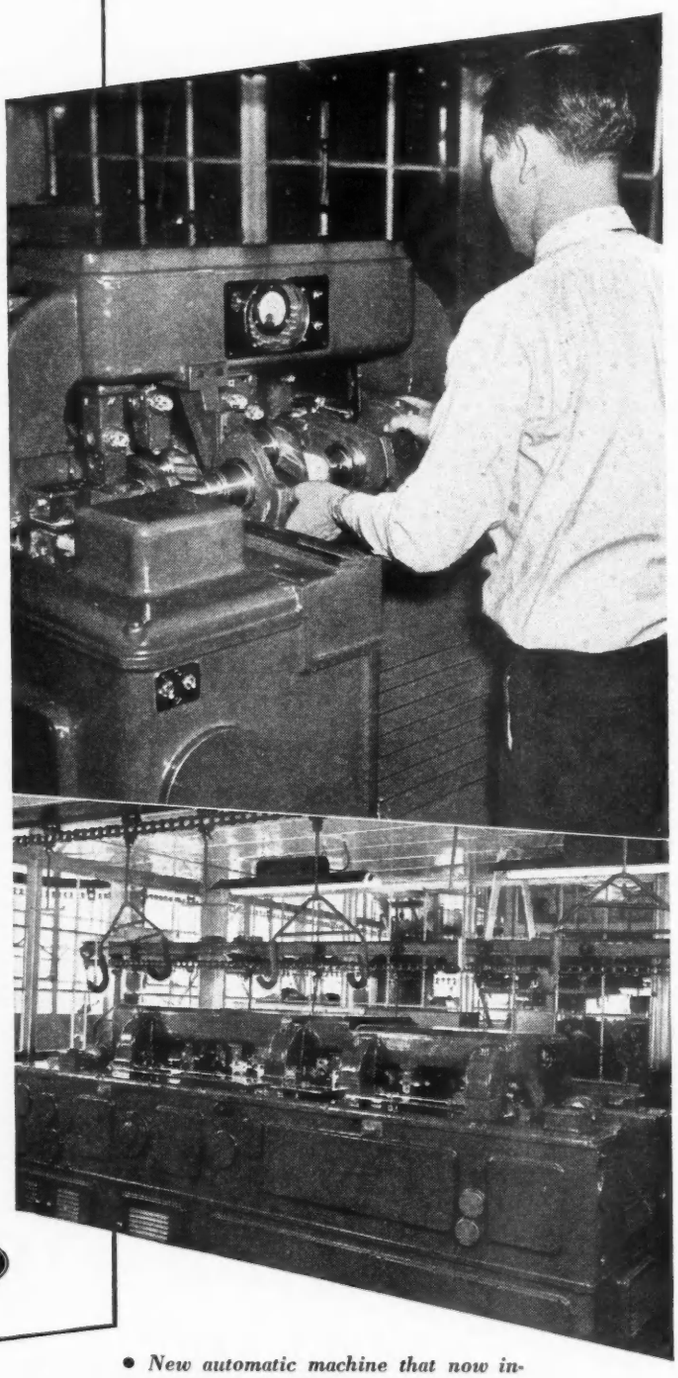
• This is just one of many automatic machines developed by Ford engineers to inspect every camshaft, piston pin, valve-seat insert and valve lifter that go into a Ford car. It employs sensitive radio type circuits to amplify minute variations in dimensions.

• Fifty dimensions are checked on every crankshaft, including the width and longitudinal position of all bearings, the squareness of thrust faces and the concentricity of the gear, pulley and flywheel pilots. The diameter and roundness of each main and connecting rod bearing are measured. A six-way stationary gage checks the clearance of the crankshaft cheeks and counterweights. The location of any dimensional inaccuracy is automatically marked and the operator notified by red light and buzzer.

• Approximately 70 relays, 65 solenoids, 25 radio tubes and 8000 feet of wire were used in the construction of this machine. The accuracy of the electric gages is within less than one ten-thousandth of an inch. To avoid the effect of temperature variations, it is installed in one of the many air-conditioned constant-temperature inspection rooms.

• In the Ford plant, insistence on 100 per cent inspection is carried to unusual lengths. Since it includes virtually all machined parts, efforts are being constantly exerted toward the development of new machinery for this purpose. The new crankshaft inspection machine is the most recent example.

FORD MOTOR COMPANY Ford



• New automatic machine that now inspects all Ford and Mercury crankshafts.

IN THIS ISSUE . . . .

AUTOMOTIVE INDUSTRIES

Reg. U. S. Pat. Off.
Volume 82 March 15, 1940 Number 6

Radium F

It took Firestone to provide commercial outlet for Polonium, the first radio-active element isolated by Madame Curie almost 40 years ago. Known as Radium F, Polonium has an atomic weight of 210, atomic number 84, emits alpha rays exclusively. Polonium is alloyed in the electrodes of the new Firestone spark plugs and, considering the fact that the material costs $2,000,000 an ounce, it is fortunate that only a trace is required to produce an ionized gap. Theoretically, at least, the ionized gap materially improves the efficiency of the spark, thus making better use of the impressed voltage.

Fuels & Lubes

There is little doubt that petroleum products are right on the brink of one of the most interesting phases of development since the beginnings of the automobile industry. In almost every direction we note the increasing use of additives—as solvents in fuels, inhibitors and detergents in lubes. It has been pointed out by petroleum technologists that the requirements of modern equipment have well nigh outstripped the capabilities of straight petroleum products. Additives offer the solution to current problems and the problems of the near future. If one could see still further ahead, it is conceivable that the next step may well be the development of simple synthetic hydrocarbon molecules such as were discussed at the Michigan Conference last fall.

Valve Clinic

March issue of *Hard Facts* (Wilcox-Rich) introduces us to the valve clinic which is an important point of contact between Wilcox-Rich and the engine builder. A capable staff of engineers and researchers headed by Vince Young, served by one of the finest motor laboratories in the industry, sits in on valve gearing problems. Incidentally, this bulletin shows on the cover page an organization chart which follows the manifold course of the valve clinic. We mention this because it sheds light on the committee or conference method so widely employed in our industry.

More Production Lines will be found on page 284

GENERAL

Dealers Seek March Millenium **265**

The last part of March brings up proposed legislation for the regulation of the motor vehicle industry. The N.A.D.A. has sent out a post card ballot on the subject and March 30 is the deadline for the returns. Far-reaching, indeed, are the possibilities of this act if it passes and in this article Herbert Hosking discusses the pros and cons in some detail. It will post you on the subject in a most enlightening manner.

TESTING

Testing Equipment Feeds Progress **272**

Within recent months the Hayes Industries, Inc., have installed new laboratory facilities that bring to bear the most precise scientific methods for the testing of fans and mufflers for passenger cars. The setup is unique and methods of special interest.

BUSES

Building Integral Body and Chassis **278**

War swept Europe has not interfered with engineering progress in England as much as the average American might suspect. They are "on their toes" and M. W. Bourdon, foreign correspondent for AUTOMOTIVE INDUSTRIES, gives an account of the motor transport exhibition. This is not so much an account of the show as it is an account of recent developments in the commercial transport field.

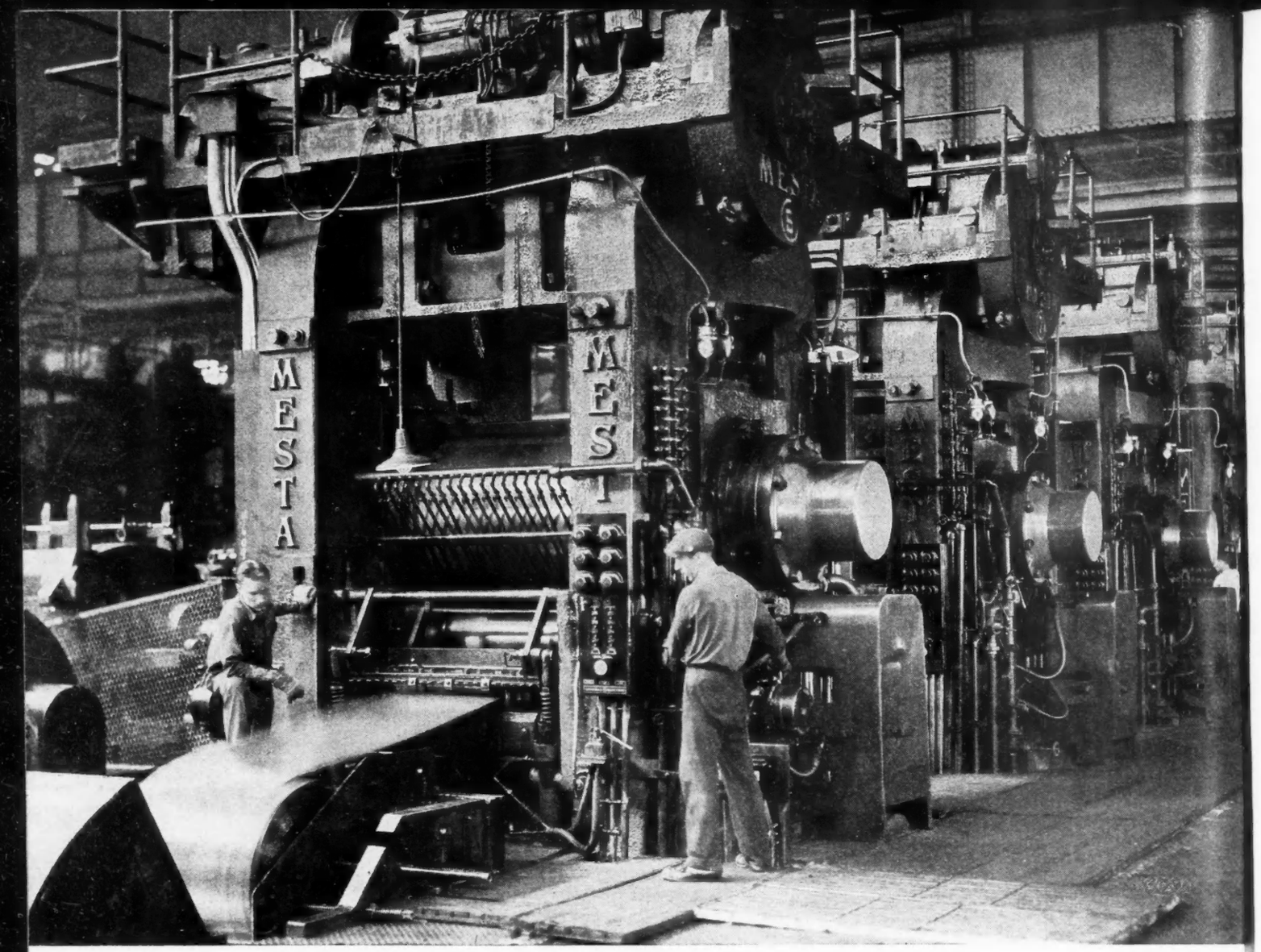
SPECIFICATIONS

Specifications of American Tractors **290**

Regrettably omitted from the March 1 issue of AUTOMOTIVE INDUSTRIES were the specification tables of American wheel and track-laying type tractors. Space limitations made it necessary but here they are now in all of their usual completeness.

Business in Brief 267
High Octane Fuels 268
Automotive Materials 274
Men and Machines 280
Production Lines 284
Engineering Drawings 285
Just Among Ourselves 287
News of the Industry 293

Since 1913 all issues of AUTOMOTIVE INDUSTRIES have been indexed in the *Industrial Arts Index*, which can be consulted in any public library.



ARE YOU MEETING COMPETITION with Today's Steels?

Competition does not begin at point of sale—that is where it ends. Competition starts when an idea is conceived—and it cannot be separated from design, selection of materials, production cost, and service tests. Therefore, no matter what results you may have had in the past, you cannot afford to disregard the competitive advantages offered by today's steels.

Inland has on file case after case of faster production, fewer rejections, finer finished products, and thousands of dollars added to profits by the use of the more recently developed Inland Ledloy that saves from a few dollars to $50.00 or more per ton of steel machined—Inland Hi-Steel that builds stronger yet lighter—and, Inland specially processed sheets that help users meet competition by their superior workability and finer finish.

The expert assistance of Inland Metallurgists is at your command to show you how today's steels can help you meet competition. Your inquiry will receive immediate attention.

SHEETS • STRIP • TIN PLATE • BARS • PLATES • FLOOR PLATES • STRUCTURALS • PILING • RAILS • TRACK ACCESSORIES • REINFORCING BARS

INLAND STEEL CO.

38 S. Dearborn Street, Chicago • Sales Offices: Milwaukee, Detroit, St. Paul, St. Louis, Kansas City, Cincinnati

AUTOMOTIVE INDUSTRIES

Published on the 1st and 15th of the month

Vol. 82, No. 6
March 15, 1940

Dealers Seek March Millennium

This month's events will have a lasting effect on the course of factory relations

By HERBERT HOSKING

THE LAST half of March will be one of the most eventful fortnights in the long history of the struggle to establish a satisfactory basis for relations between automobile factories and automobile dealers. The significant dates in the present chronicle are March 9, on which date the National Automobile Dealers Association mailed to every dealer in the United States a copy of the draft of a proposed Motor Vehicle Industry Act which Representative Wright Patman has expressed himself as being willing to introduce in Congress if enough dealers want it. The draft bill was accompanied by a speech made by Mr. Patman at the last convention of the N.A.D.A. and another by Donald Richberg, made at the same meeting. As a leading exponent of the use of the Federal checkrain in curbing the wild horses of free enterprise, Mr. Patman seems a little more than willing—anxious perhaps—to become the godfather of a piece of legislation which would define the automobile industry as being in the public interest, and, therefore, subject to specific Federal legislation to regulate bargaining between "weak" dealers and "strong" factories.

On March 20, the Federal Trade Commission will be the host at public hearings on a schedule of proposed Fair Trade Practice Rules for the Automobile Industry. These rules are also aimed specifically at the relations between automobile factories and automobile dealers, with a side glance at the truck industry.

March 30 will be the deadline date for the dealers of the United States to get into N.A.D.A. headquarters, postcard ballots expressing their favor or disfavor of the proposed Federal legislation mentioned in the opening paragraphs. Before March 30 they will have had a chance to see which way the wind is blowing with respect to the Fair Trade Practice Rules of the Federal Trade Commission, which if adopted, would furnish a satisfactory substitute for legislation in the minds of many dealers who want a codification of the points at issue between themselves and the factories, but who are somewhat wary of playing with irrevocable legislation on the subject.

There is no guarantee, of course, that adoption of the proposed Fair Trade Practice Rules, and their promulgation by the Federal Trade Commission, would forestall an attempt by Mr. Patman to sponsor legislation in Congress directed at the automobile industry. The proposed F.T.C. rules and any Federal bill which was passed could exist concurrently, and even deal specifically with some of the same questions, except that in looking at Federal legislation there always comes to mind the cry of Little Red Riding Hood: "What big teeth you have, grandma!"

In a message to General Motors dealers Alfred P. Sloan, Jr., points out that as between the things which would be required of automobile manufacturers in the proposed Federal legislation, and those which are being performed in practice under existing contracts, the proposed bill would require very little that is not now covered. The principal differences between current practice and the text of the proposed bill are found in the suggestion that dealer contracts should run for three years, and that automobile manufacturers should purchase the assets of dealers whose contracts are cancelled for cause.

But the distinction in method of approach to the problem is a profound one. The danger in seeking legislative remedies for matters which can be adjusted by other methods is a danger that worries many other people besides Mr. Sloan.

Mr. Sloan's statement of the case is worth noting: "If the dealers of the automotive industry take the politician into partnership," he says, "even on a junior basis, the evolution must be that the politician, slowly but surely, will take the part of a senior and controlling partner. That is the evolution of the government bureaucracy. The industry will not long be subject to regulation—it will soon be subject to regimentation. And the regimentation of business means the strangling of individual initiative and enterprise. It sounds the death knell of progress."

There are few executives in the automobile industry who would find much to differ with in Mr. Sloan's position on the question. So far as the dealer body is concerned, there are thousands of dealers who feel that way, too. There are other thousands who have qualms about the effect of Federal regulation on the business but are "willing to try" its results. Those

who sincerely and actively believe that Federal regulation would solve the ills of the industry are unquestionably a minority.

So far as can be learned, the N.A.D.A. ballot will not distinguish clearly between the "willing to try" group and the zealots for Federal regulation. Some local, advance balloting has been done in automotive trade associations. While there are significant differences in the relative strength of each type of dealer thinking on the question, generally according to the region in which the sample is made, there is an increasing tendency to shy away from the Federal halter.

A good many dealers who have been active leaders of their constituency realize the essential nature of political action, of which the relations of factories with dealers is a branch. The corollary to this is, that a good many dealers who are public advocates of Federal regulation of the industry because of their wish to be connected with the popular program of the moment, and because of a wish also to use whatever means are at hand to ameliorate undesirable conditions existing in the contractual relations between factories and dealers. The privately expressed opinions of such dealers are frequently on the side against Federal regulation of the industry.

Another factor in the push for an F.T.C. fair trade practice code has been the National Automobile Dealer's Association's peculiar position during the past five years. Its maximum membership during that period has represented a minority of the whole dealer body. Within the organization, there has been a constant clamor for a "strong" position and an effective program. The organization program leading to the proposal of an F.T.C. fair trade practice code, the activity centering around the Withrow resolution and the F.T.C.'s report on the Motor Vehicle Industry, and finally, the proposed Federal regulatory bill have all been a powerful answer to those within the organization who kept needling for a dynamic program. These are frank words, which do not question for one minute the sincerity of most of the men who were concerned with seizing on Federal action as the answer to the industry's problems. They merely point out that all the ballyhoo for the F.T.C. code and the Federal legislation does not stem from the inherent virtues of the ideas they contain.

As between a Federal bill and an F.T.C. code, there is everything to be said in favor of the F.T.C. code. In the first place it would seek to eliminate types of practice which flourish in the dealer's back yard as well as those which are blamed on Detroit and the other manufacturing centers. In the second place, while the F.T.C. machinery is probably only slightly less cumbersome than that of the Federal courts, it is much more familiar with the ways of industry, and much more prone to conduct its investigations and its settlements on a human basis; with due regard for the facts of life and trade.

It must be emphasized, in summing up, that both the F.T.C. code, and the Federal bill are still in the proposal stage. The F.T.C. hearings on March 20 are the nearly final phase, however, of the routine which leads to the promulgation of an F.T.C. fair trade practice code.

The N.A.D.A. ballot, which will be counted after March 30, is simply to determine whether a majority of dealers would favor the introduction in Congress of a bill like the sample which was sent them.

The F.T.C. hearings will provide a discussion forum which will give a re-airing to the questions involved. The testimony which comes out of the hearings will undoubtedly influence many a dealer in the way he straw-votes on the proposed Federal bill.

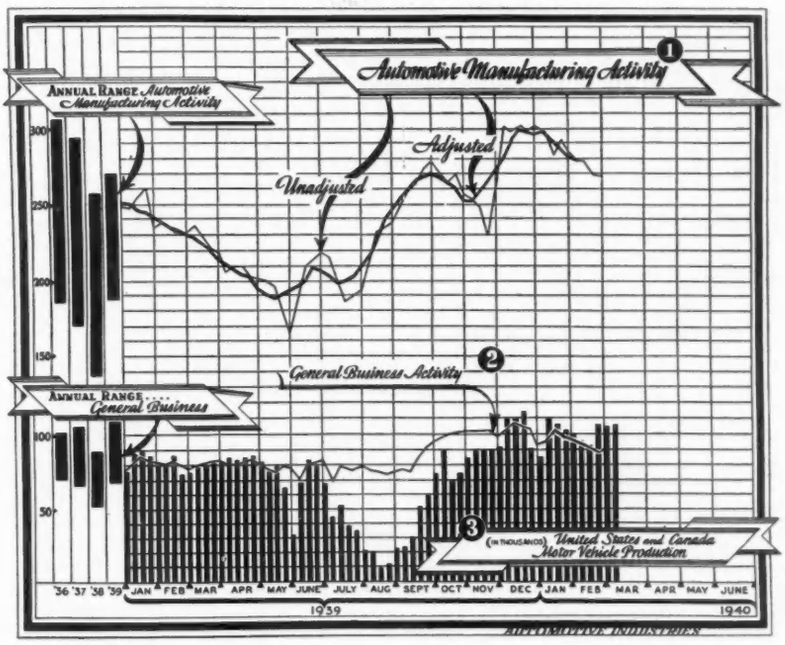
Because, as we have said above, there is a distinction between the bedrock feelings of dealers on the subject of Federal regulation and how they may fulminate on the subject, it would be difficult to predict the results of the N.A.D.A. ballot. But if it does favor continuing the push for Federal regulation there is no reason to assume that all the dealers who vote for it will go all the way with the program.

The Brass-Hat Rack

"Just think—in 10 years they will only be worth a dollar and forty cents a hundred pounds!"

BUSINESS IN BRIEF

Our own view of automotive production and sales; authoritative interpretation of general conditions



Weekly indexes of automotive general business charted

March May Top Record February

PRODUCTION of cars and trucks during the first half of March showed a continuation of the pace established during the last weeks of February with schedules of a number of manufacturers subject to upward revision as the result of anticipated increases in retail deliveries with the opening of the usual spring selling season.

A preliminary check[2] of factory schedules for the week ending March 9 indicated that output would exceed that of the previous week by several thousand units to bring production to approximately 106,000 cars and trucks. With continuance of this rate during the week ending March 16 it is estimated that output for the first half of March would be at least 232,000 units with the possibility that this figure will have to be revised upward if the expected improvement in sales is verified by sales reports for the first 10 days of the month.

Barring unforeseen developments it is expected that the production curve will continue to go upward moderately during March in extension of the rise which began during the latter part of February when encouraging sales reports necessitated upward revisions in the production schedules of most manufacturers. The official estimate of February production, released each month by the Automobile Manufacturers Association, places output for the month at 421,690 units which is several thousand units higher than preliminary estimates made from a week to 10 days earlier.

[1] 1923 average = 100; [2] Prepared by Administrative and Research Corp. New York. 1926 = 100; [3] Estimated at the Detroit office of AUTOMOTIVE INDUSTRIES.

General Motors divisions continued to lead the production parade with total estimated output of cars and trucks by all divisions running close to 45,000 units per week during the first half of March. Chrysler divisions were sticking to the high rates maintained throughout the winter with output running around 24,000 cars and trucks per week and Ford divisions were closely behind with weekly production running a little better than 20,000 units. Among the independents Studebaker continued to hold the lead although followed closely by Packard, Hudson, and Nash in that order.

Early reports on retail deliveries for February released by several manufacturers indicated that sales for the month were running from 42 to 59 per cent ahead of the same period of a year ago. Pontiac reported the best February in its history. Chevrolet sales stimulated particularly by the pickup during the last 10 days of the month ran 47.4 per cent ahead of last year. Buick sales also continued to run strong. Reports by Ford of a similar increase in truck sales indicate that spring activity in the commercial vehicle field also is beginning to be felt. Ford truck sales for February were 33 per cent over last year.

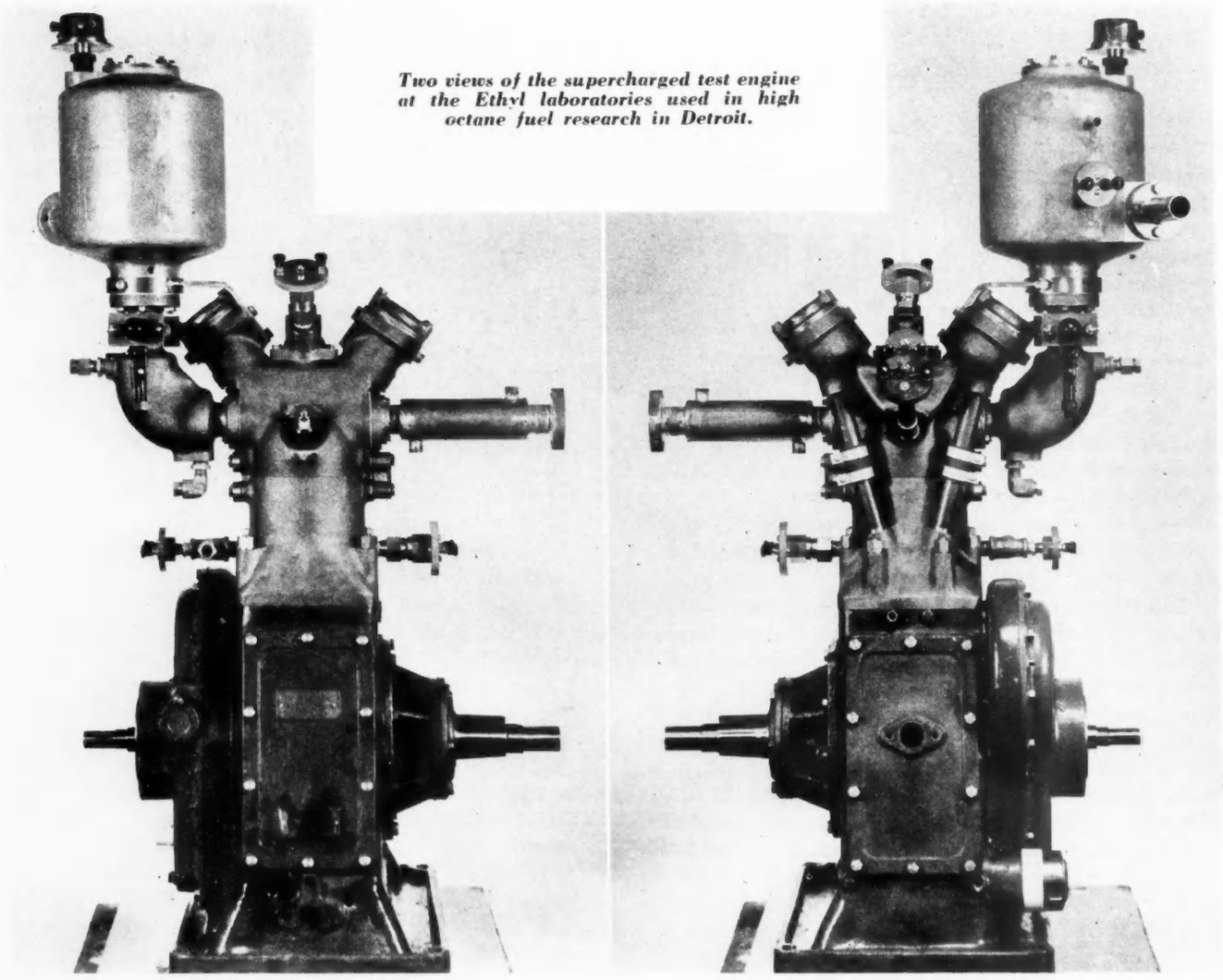
AUTOMOTIVE MANUFACTURING ACTIVITY continued to ease off slightly through the weeks ended Feb. 24 and March 2 with the unadjusted index charted herewith passing through the points 269 and 268, respectively. Trailing the unadjusted curve by four weeks, the path of the adjusted index moved to 281 during the week ended Feb. 3 and to 278 in the week ended Feb. 10.

Britain Favors High

BRITISH aircraft engines have been run on 87 octane fuel for the most part during the past four or five years, according to F. R. Banks, technical manager of the Associated Ethyl Co., Ltd., of London. The British Air Ministry has encouraged the development of engines designed to use 100-octane fuel, but while some of these have been built, they are still in the experimental stage. The author said he had found that large American radial engines with two valves in the head were more sensitive to differences in fuel characteristics than similar British engines having four valves per cylinder, and he ascribed this sensitiveness to swirl in the combustion chambers due to the use of tangential inlet passages.

Bristol uses a four-valve "penthouse-type" of cylinder head which gives good breathing capacity but involves greater manufacturing difficulties than the American two-valve head. The valves cannot be so easily enclosed or lubricated, and it is also less practicable to use hollow, sodium-cooled valves. For liquid-cooled engines four-valve and three-valve flat heads are used. Mr. Banks said he preferred the three-valve type (one exhaust valve) because it permits of better coring of the head casting, better cooling of the exhaust valve, and the use of a simpler valve-operating mechanism.

The introduction of 100-octane fuels may necessitate the use of a supercharged fuel-testing engine such as



Two views of the supercharged test engine at the Ethyl laboratories used in high octane fuel research in Detroit.

Octane Fuels for Aircraft

Table I—Racing or Record Fuels

Fuel No. ...	1	2	3	4	5	6	7
Straight-run aviation gasoline, 74 octane No...	....	....	....	55%	....	....	....
Light Spirit (77 to 148 F.)	....	....	....	....	20%	20%	....
Benzol	78%	70%	30%	22%	60%	60%	70%
Methanol ..	....	10%	60%	....	20%	20%	10%
Ethanol	....	....	....	23%	....	....	....
C.P. Acetone	....	....	10%	....	....	....	....
Light spirit (o.68 spec. gr.)	22%	20%	....	....	....	....	20%
C.C. lead per U.S. gal. ...	3.3	3.3	4.1	5.8	8.3	3.3	5.8
Sp. Gravity at 60 deg. F.	0.833	0.828	0.824	0.770	0.813	0.813	0.328
Water tolerance	nil	0.5%	14.3%	1.7%	1.1%	1.1%	0.5%
Octane No..	96	95	92	90.5	96	95	96
Octane No. without lead	91.5	92.5	92	88	93	93	92.5
Heat value B.t.u. per lb.	18,550	17,710	12,685	18,140	16,860	16,680	17,710
Latent heat, B.t.u. per lb.	166	195	350	198	206	206	195

Distillation curves for these fuels are shown in Fig. 1.

that developed by the Ethyl Gasoline Laboratories or that of the Delft Laboratory of the Shell Petroleum Company. Unfortunately, the checking of fuel samples by these supercharged units is rather complicated and expensive.

German manufacturers are now in regular production on aircraft engines with gasoline injection, aircraft carburetors being gradually eliminated except for the smaller engines. This development is of particular interest in view of the probable increase in cylinder numbers in future large aircraft engines and the resulting greater difficulties of the distribution problem. Fuel injection directly into the cylinders would seem to be an aid in meeting the modern requirement for engines combining high specific outputs for take off with low specific consumption in cruising.

In Table I, herewith, are given the compositions and properties of a number of fuels specially prepared for use in record-breaking, liquid-cooled engines of high specific power, in which alcohol is added to decrease the inlet temperature and thus to increase the density of the charge. It will be seen that most of them are gasoline-benzol-alcohol blends with tetra-ethyl lead added.

With the exception of No. 3, all of the fuels gave satisfactory results with regard to distribution and engine response to the throttle. Fuel No. 1 was used in the Rolls-Royce air engine which won the Schneider Cup in 1929 and subsequently established a world's speed record. Fuel No. 2 was used by Campbell and Eyston in establishing new land speed records. Fuel No. 3 was used in the Rolls-Royce engine with which the air-speed record was raised above 400 m.p.h. To establish this record, no change was made in the engine, but the new fuel permitted of increasing the engine speed by 200 r.p.m. This fuel, however, could be used only by previously warming up the engine with other fuel. The engine showed signs of "damping out" at all throttle openings up to 200 m.p.h., but under full throttle there was no trouble. Fuel No. 4 was used in the 2800 hp. Fiat engine which now holds the world's speed record.* Fuels Nos. 5, 6, and 7 are recent developments of fuel No. 2 for use in a very high-duty liquid-cooled engine, for which No. 6 was finally adopted. With it the engine showed a specific fuel consumption of 0.68 lb. per b.hp.-hr. at a net b.m.e.p. of 327 lb. per sq. in., the gross b.m.e.p. (taking account of the power consumed in driving the blower) amounting to 368 lb. per sq. in.

British manufacturers of aircraft engines do not use hollow-head valves but only cool the stems with sodium. This is accounted for by the fact that most of the large British engines have four valves per cylinder. To prevent scaling of the exhaust valves in large engines with only two valves per cylinder, the valve seats are sometimes coated with an alloy known as "Brightray," which contains 80 per cent nickel and 20 per cent chromium. Rolls-Royce coats not only the valve seats but also the valve heads with Brightray, and this is said to have greatly improved the

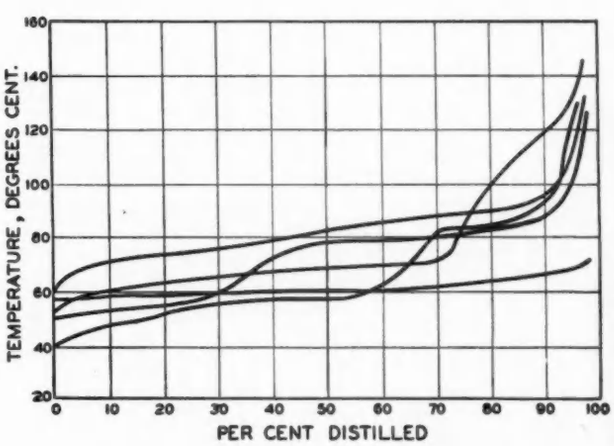


Fig. 1—Distillation curves of racing fuels

*Since the paper was written the world's absolute speed record has been broken by a German Heinkel pursuit plane piloted by Capt. Dieterle, the new mark being 464.36 m.p.h. This is the first time in many years that the absolute record is held by a land plane.—Editor.

valve condition. Valves have been made completely of Brightray, but it is doubtful whether they can be made cheaper than valves of austenitic steel treated with Brightray.

The valve steel most commonly used in British aircraft engines conforms to an Air Ministry specification calling for the following composition:

C	0.35— 0.45 per cent
Cr	12.50—14.50 " "
Ni	12.50—14.50 " "
Mn	0.50— 1.00 " "
Si	1.00— 1.75 " "
W	2.00— 3.00 " "
S and P	0.03 per cent maximum

Steel inserts for valve seats have entirely replaced the aluminum-bronze inserts formerly used. A valve-seat-insert material known as N.M.C. is much used with valves of the material for which the specifications are given in the above table, with Stellited seating surfaces. The insert material N.M.C. contains 12 per cent nickel, 5 per cent manganese, 3.5 per cent chromium, 0.5—0.6 per cent carbon, and 0.5 per cent silicon. Inserts are used either with or without Stellite seat facings. Seat inserts of the same material as the valves also are used, both with and without Stellite seat facings. When the valves have seat facings of Brightray, the inserts are made either of Silcrome No. 1 or of the valve material specified in the above table.

Differential seat angles, with the seat angle of the insert from 0.5 to 1.0 deg. smaller than that of the valve, are employed by most British manufacturers. The valve then rests on the insert with the large diameter of its head when cold, and over the whole face width when at normal operating temperatures.

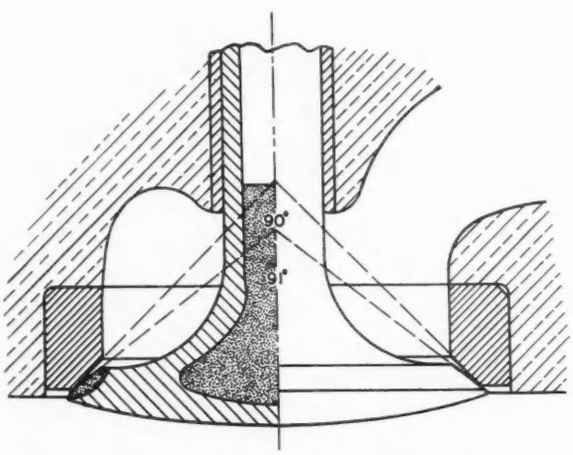


Fig. 2—Differential angles for valves and seats

One of the most important developments in England during the past year or two was that of a spark-plug insulator of sintered aluminum oxide. This material was first developed for the purpose by the Siemens-Schuckert Works in Germany, who use the trade name "Sinterkorund." There are now a number of similar materials with sintered aluminum oxide as their basis. The Siemens material in its finished state is claimed to be pure aluminum oxide, while the others contain fluxes and binders. The principal advantage of the aluminum oxide insulator is that it is not attacked by the products of combustion of leaded fuels, which cannot be said of mica. The Sinterkorund-insulated spark plug is already in wide use in Germany. In England mica-insulated plugs have been used in practically all aircraft engines to date, but the aluminum-oxide-insulated type will be put in use there in large quantities in the near future.

Another development in spark plugs is that of the use of thin ground electrodes. From four to eight wires of about 0.020 in. diameter extend from the shell radially to the center electrode. These wires are made of either platinum-iridium or platinum-rhodium alloy, 20 per cent iridium and 10 per cent rhodium being used. To prevent deflection of the thin wires by the gas blast and consequent change in the width of the gap, stub wires are fastened into the shell directly in front of the ground electrodes. These also prevent corrosion of the ground electrodes between the shell and the central electrode, evidently because they deflect the current of hot gas and prevent it from coming in such intimate contact with the ground electrodes.

Substitution of Sinterkorund for mica spark plugs is expected to eliminate two kinds of trouble experienced with the latter, viz., "pinholing" or puncturing of the mica insulation, and excessive lead deposition on the mica insulators. The last defect occurs mainly in the engines of military planes. Often a squadron keeps its engines idling for a considerable length of time waiting for the order to take off. During the idling period the deposit accumulates rapidly, and on taking off, the deposit warms up and the insulation of one or more plugs breaks down. With highly boosted engines such a failure of one plug usually means a back-fire into the distribution system, which explodes the charge therein and stops the engine completely. Some serious accidents due to this cause have occurred with high-speed machines. This back-firing into the mixture supply system is now made impossible by fitting flame traps or dampers in the induction system close to the inlet ports.

All of the newer British air engines use 14-mm. plugs, which is a nice size to handle. Gas-tightness is a very important requirement, and the British Air Ministry limits the gas leakage of the cold plug before use to 1 cu. cm. per min. under a pressure of 100 lb. per sq. in.

Point erosion and increase in gap width are greatly reduced by the interference suppressor or resistor incorporated in the shielding-cable elbow attached to the plug, and such a resistor of 1000 ohms together with the multiple fine-wire ground electrodes has made it possible to obtain 200 hours high-duty service without attention to the plugs. The resistor, moreover, on account of its high thermal resistance, prevents the cable end from being damaged by the heat.

The author showed a number of photographs of spark plugs after extended periods of service. These plugs had central electrodes composed of an alloy of 96 per cent nickel and 4 per cent silicon. Tungsten when used as electrode material shows the greatest resistance to erosion and gap-widening, but it is subject to the objection that it requires a much higher

voltage for a discharge across a gap of given width. But since with the conventional electrode materials the gap increases in width much more rapidly, after a few hours of operation the plug with tungsten electrode may not require as high a sparking voltage as the conventional one. Molybdenum has about twice the resistance to erosion as nickel, but is more subject to hot erosion by leaded fuel than any of the other materials used for electrodes.

According to unofficial statements, the adoption of direct injection into the cylinders on German aircraft engines has reduced the specific fuel consumption by from 10 to 15 per cent. The author thought this comparison must refer to German liquid-cooled engines which had the carburetor between the blower and the engine, an arrangement which makes it difficult to get good economy. He believes that in air-cooled engines with the carburetor on the suction side of the blower, the possible gain in economy under cruising conditions would be limited to 5 per cent, and would most likely be of the order of 2 or 3 per cent. Direct injection eliminates the danger of a distribution system full of inflammable mixture at relatively high pressure. The problem of inter-cooling also is simplified, as only air need be cooled. Of course, the cooling effect of the fuel in the mixture from the carburetor, which reduces the mixture temperature by from 45 to 55 deg. Fahr. and thus results in an increase in blower efficiency, is absent here.

With direct fuel injection the "consumption loop" (sometimes called the "fish-hook" curve in this country) can be carried around the bend in the direction of weak mixtures further than with the carburetor system. Also, the use of high-octane blending agents and fuels of low volatility would be possible with direct injection, which is advantageous in reducing loss through evaporation and the likelihood of trouble from vapor lock. Starting is rendered easier by direct injection, because there is virtually a priming device in each cylinder, and warming up is necessary only on account of the lubricating oil and possibly also the cooling system. Response to the throttle was immediate in all engines with direct injection which had come under the author's observation.

The risk of damaging the engine when operating on weak mixtures is reduced with the injection system, due to better distribution, and at cruising powers the fuel consumption should be improved by, say 5 per cent. A further advantage, from the military viewpoint, concerns the engine behavior when idling, in the case of "silent-approach" tactics, where bombers reach a high altitude during their flight and then, when approaching their objective, will glide for some distance without engine until they are over their target. There will be no "loading" of the distribution system with "wet" fuel and, consequently, the engine should pick up immediately when opening the throttle again.

A high degree of valve overlap has been found beneficial in conjunction with timed injection, from the points of view of complete scavenging, cooling of the exhaust valve, and power increase. But this applies mainly to work done on single-cylinder units, and a large overlap might appear to be impracticable for the full-scale engine, on account of starting difficulties and the loss of a large proportion of the air. In conjunction with an exhaust turbo-blower, a large valve overlap may offer considerable advantages. According to Ellor and Owner, in these turbo-blower installations the back pressure on the engine tends to follow variations in the boost and to be independent of the altitude at which the engine is operating.

Compression Pressures in Diesel Engines

THE accompanying chart, which is based on tests made in Germany on the standardized Army truck engine, gives the compression pressures which may be expected in Diesel engines of different compression ratios at various speeds of rotation. The tests were made with three compression ratios only, 15, 16, and 17, but we have extrapolated the results so as to cover the range from 14 to 18. A rather peculiar feature of the chart is that the curves for the individual compression ratios approach each other toward the upper end of the speed range. This would indicate that as the pressure in the cylinder reaches the higher values, the leakage greatly increases.

That for a given compression ratio the compression pressure increases with the speed is well-known, and is due to the fact that at high speeds the time during which gas leakage and heat leakage can occur is greatly reduced. If there were no gas leakage and no heat flow the compression would be truly adiabatic and would be the same regardless of the speed of rotation.

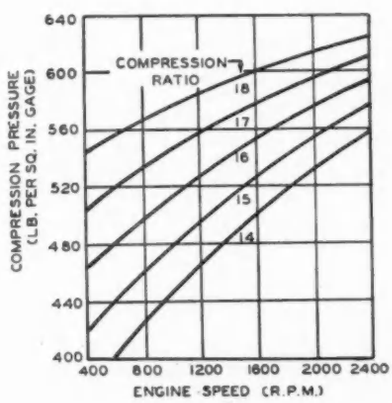
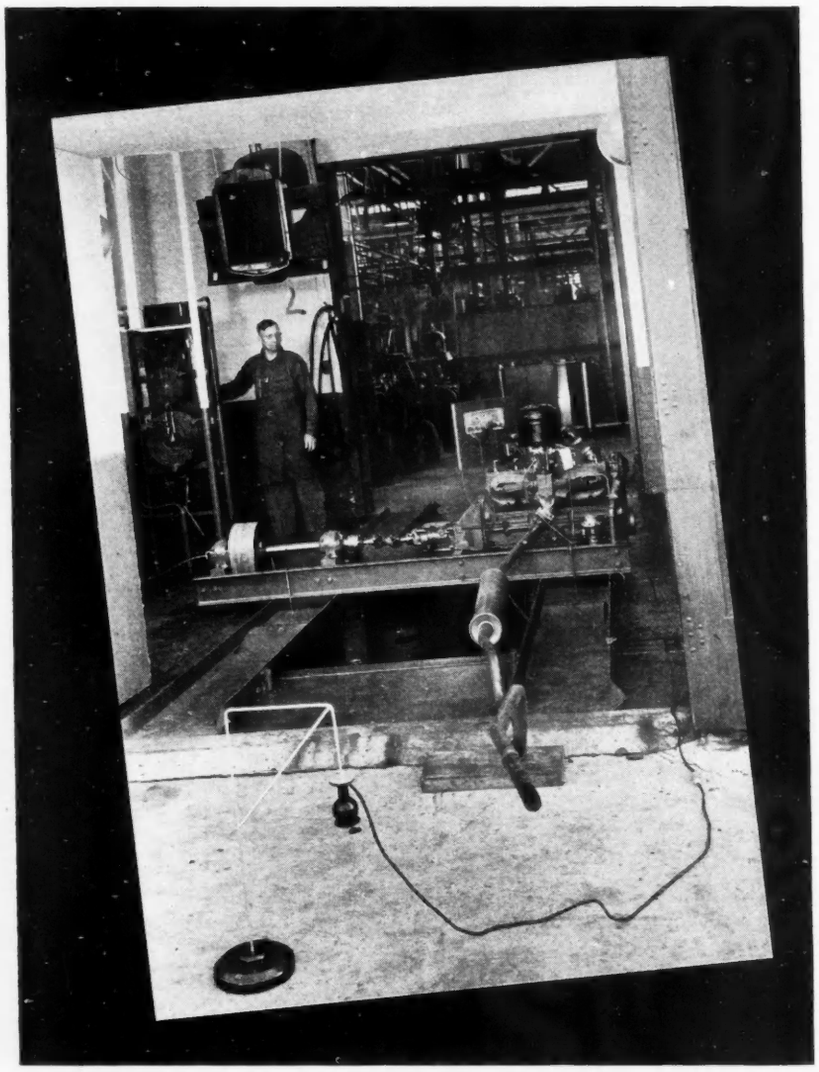


Chart of compression pressures in Diesel engines.



Muffler test department with chassis roll dynamometer is shown here. The same instrumentation is employed as for fan testing, the "8-ball mike" being suspended near the end of the tail pipe as shown.

Testing

THE ABILITY of an automotive parts producer to manufacture parts or accessories of a satisfactory character at a competitive price is taken for granted, and the more progressive organizations in this field always have been endeavoring to also provide a specialized engineering service to the industry at large. In fact, since the beginning of the industry, the motor car producer has looked to these specialists not only for improvements and basic developments, but for expert advice in the solution of current problems.

Characteristic of this high ideal is the set-up of the automotive division of Hayes Industries, Inc., Jackson, Mich., well-known producers of passenger-car fans and mufflers. Within recent months, this company has installed new laboratory facilities and unique instrumentation which bring to bear the most precise scientific methods in the solution of both fundamental-research and commercial-development problems. Moreover, the instrumentation, as will be noted later, is of the portable type, so that it may be readily transported to a customer's laboratory for proof-checking or trouble shooting at the scene of actual operation.

Armed with these scientific but practical tools, Hayes engineers have been able to study noise problems right in the engineering department's motor cars, to isolate peculiar or undesirable effects of fans or mufflers in combination with other noise-generating sources, and have been successful in modifying the product accordingly.

Time was when the fan was simply a convenient device for drawing air through a radiator. But with the emphasis upon "quiet" automobiles, the fan assumes the importance far out of proportion to its relatively simple manufacturing character and extremely low unit cost. The same is true of the muffler. Its cost is small, particularly when contrasted with replacement cost, and yet it has a major influence on the noise level of a fine motor car.

The nucleus of the engineering laboratory is the sound-insulated room, which contains wind tunnel for fan tests and a dynamometer. The walls and ceiling are treated with acoustic Celotex, so as to keep out all outside noises, as well as to muffle the sound from the chamber.

Adjoining the sound chamber is the muffler laboratory. It contains a chassis dynamometer which makes it possible to obtain tests on a complete car, although routine work is done on a production engine mounted in a cradle sliding on rails.

However, the real effectiveness of this primary equipment lies in the instrumentation provided for use in conjunction with it. Hayes is justly proud of the Western Electric recording frequency analyzer, the first machine (Serial No. 1) having been built for it by Electrical Research Products, Inc. This equipment comprises two cabinets—the sound-frequency analyzer, and the graphic level recorder, supplemented with various accessories. Among the latter is the transmitter or "eight-ball" mike, a synchronous motor for sweeping the dial of the analyzer.

Equipment Feeds Progress

of Hayes Industries in development of new automotive parts

Combination of these electronic devices makes possible the exploration of many variables. Thus it is possible to obtain:

1. A continuous record of noise in decibels, in terms of time or speed;
2. A continuous record of selected frequency ranges, by the use of the frequency analyzer;
3. An isolation of unique or undesirable noises, noted by ear and located on the chart by a hand-operated stylus control;
4. A graphic record of high-frequency vibrations, outside the audible range, detected by the use of a new portable, vibration pickup which is substituted for the sound transmitter.

For studies connected with fan design, the fan is mounted in the dynamometer, as illustrated, and, arranged to draw air through the wind tunnel. Wherever feasible, the entire front sheet-metal assembly of a given car is reproduced and interposed between the fan and the outlet of the tunnel so as to simulate actual operating conditions. The equipment gives accurate control of speed and readings of torque. Rates of air flow are calculated from pitot-tube readings in the wind tunnel.

When operated at the speeds current in passenger-car engines, the fan is a rather capable noise-maker at the best. The problem is not only one of holding the noise to a reasonably low level, but also includes the isolation of undesirable sounds which may become important when combined with those emanating from

(*Turn to page* 306, *please*)

Perspective of sound-insulated test chamber with wind tunnel and fan dynamometer on the right. Along the wall on the left are the frequency analyzer and graphic recording instruments. The "8-ball mike" is shown suspended over the fan.

TESTING

New Developments in AUTOMOTIVE

Bethlehem Develops a New Air-Hardening Tool Steel

AN AIR-HARDENING tool steel, designed to replace steels requiring liquid quenching for developing the characteristics essential in dies, punches and similar tools, was recently brought out by Bethlehem Steel Co. After tests in the laboratory and under actual service conditions the following approximate analysis was found to give the properties desired: Carbon, 1.00 per cent; manganese, 2.00; chromium, 2.00; molybdenum, 1.00 per cent.

Essential advantages claimed for the new steel are: (a) Good hardenability when air quenched, comparable to many liquid quenched die steels; (b) Low quenching temperature, 1550-1625 deg. Fahr., 100-200 deg. Fahr. below that required for ordinary air hardening die steels with equal hardness. This simplifies the furnace operation, lessens the chance of overheating the corners of a machined die, and minimizes distortion and danger of cracking; (c) Satisfactory machinability in annealed condition; (d) High abrasion and wear resistance; (e) Ease of heat treatment; (f) Good hardness penetration.

A series of tests were made to determine the physical properties. These tests were all carried out on a steel of the following analysis: Carbon, 0.95 per cent; manganese, 2.04; phosphorus, 0.016; sulphur, 0.017; silicon, 0.23; chromium, 1.93; molybdenum, 1.04 per cent. Except in the distortion and hardenability tests the test specimens were taken from 1 in. square annealed bar stock. For the distortion tests 1¼ in. samples were cut from annealed forgings of 5½ in. diameter, upset from 4½ in. square billet stock.

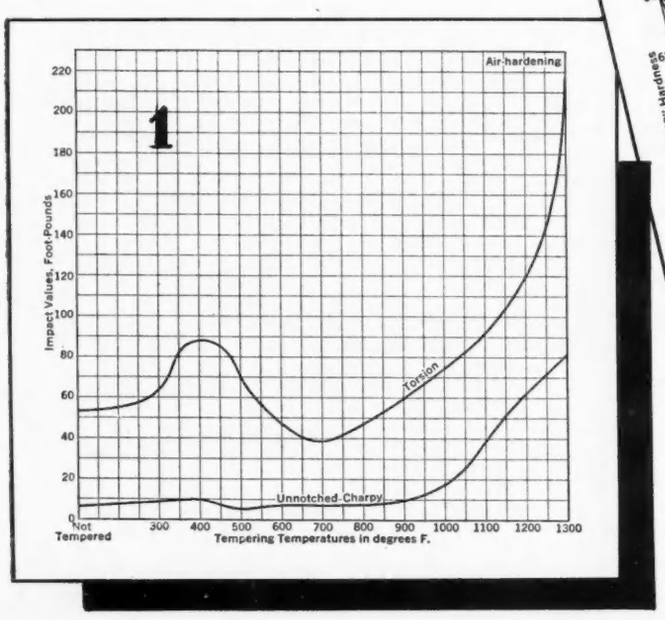
Critical Points—Dilatrometric tests on 1 in. round specimens, heated and cooled at a rate of 400 deg. Fahr. per hour, gave the following ranges:

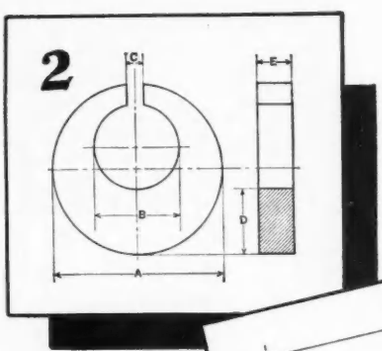
Heating: Ac range, 1370 to 1440 deg. Fahr.

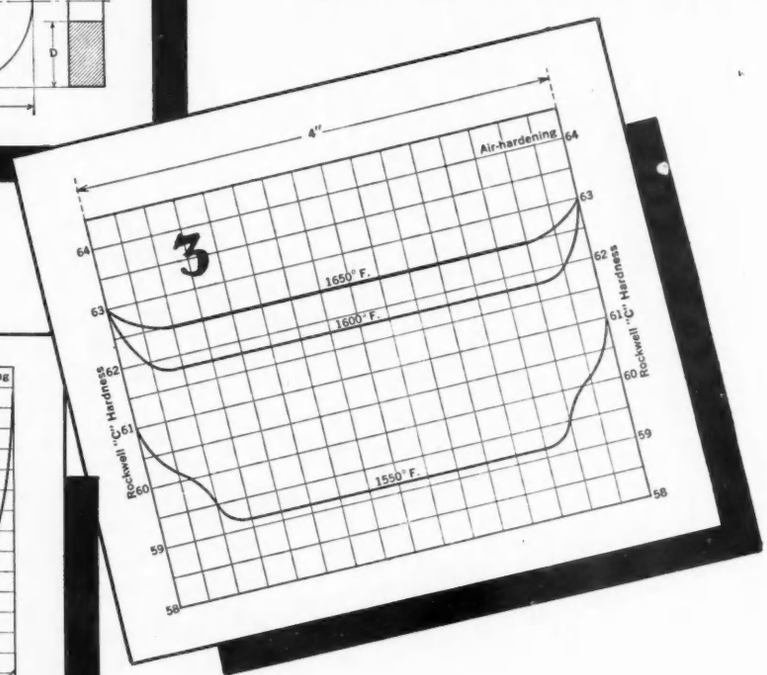
Cooling: Ar range, 1300 to 580 deg. Fahr.

Hardness—Specimens 1 in. square and 4 in. long were hardened in still air at temperatures ranging from 1450 to 1800 deg. Fahr., at 50 deg. intervals. The hardened specimens were fractured and fracture ratings and Rockwell hardness determined. The results obtained are given in Table I.

Tempering—Specimens 1 in. square and





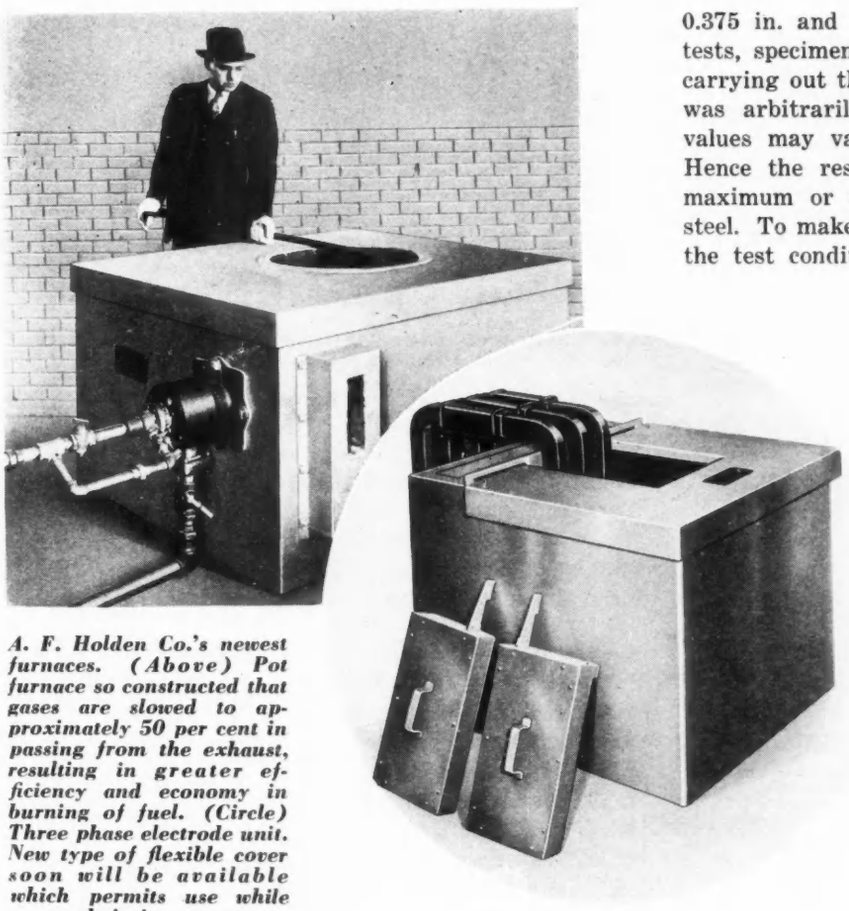


1. Impact properties of Bethlehem air-hardening tool steel after air cooling from 1550 deg. Fahr. in still air and tempering.

2. Sample locations.

3. Hardenability curve of Bethlehem air-hardening tool steel.

MATERIALS . . .



A. F. Holden Co.'s newest furnaces. (Above) Pot furnace so constructed that gases are slowed to approximately 50 per cent in passing from the exhaust, resulting in greater efficiency and economy in burning of fuel. (Circle) Three phase electrode unit. New type of flexible cover soon will be available which permits use while work is in process.

TABLE I
Fracture Ratings and Rockwell Hardness

Treatment Deg. Fahr.—Still Air	Fracture Rating	Rockwell Hardness
1450	9¼	57
1500	9¾	62
1550	9¾	63
1600	9½	63
1650	9	63
1700	8¾	63
1750	5	46
1800	4½	44

2 in. long were hardened in still air from 1500, 1550, 1600, 1650, and 1700 deg. Fahr. Tempering was then carried out at temperatures ranging from 300 to 1300 deg. Fahr. The results obtained are given in Table II.

Impact Strength—Tests for Charpy and torsional impact values were made on specimens hardened in still air from 1550 deg. Fahr., and tempered at 100 deg. intervals from 300 to 1300 deg. Fahr. The Charpy specimens used were of the unnotched type, 0.250 by 0.375 in. and two in. long. For the torsion impact tests, specimens of 0.250 in. diameter were used. In carrying out the latter a striking speed of 600 r.p.m. was arbitrarily selected. It is known that impact values may vary with the speed used in breaking. Hence the results do not necessarily represent the maximum or minimum obtainable for this type of steel. To make comparisons with other impact values the test conditions must therefore be identical. All specimens were rough machined oversize, heat treated, and ground to size. The results are shown graphically in Fig. 1.

Distortion—Table III shows the changes in the dimensions of the test piece in inches per inch after the various steps in the heat treatment. In each case the results shown represent the changes from the annealed test piece. The sample locations are shown in Fig. 2.

Hardenability — Specimens four in. long were cut from an annealed 4½ in. square billet and hardened in still air from 1550, 1600, and 1650 deg. Fahr. The specimens were then halved and Rockwell hardness readings taken at ⅛ in. increments along the original longitudinal central axis of the 4½ in. square billet. The results obtained show the hardness penetration in the center, measured from the transverse faces of the 4 in. length. The Rockwell hardness developed is shown graphically in Fig. 3.

All charts, drawings and tables referred to in the foregoing article will be found on this and the preceding page, with the exception of Table III which has been placed on page 276.

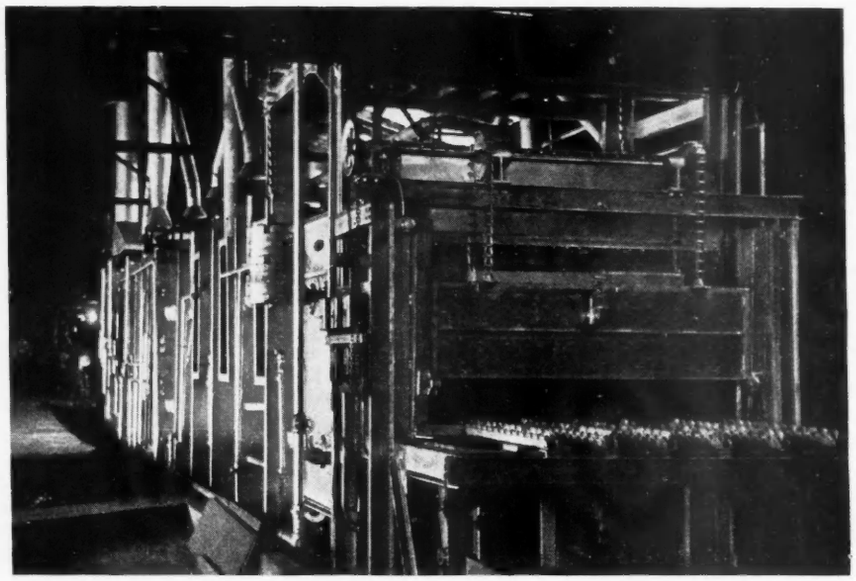
TABLE II
Rockwell Hardness in Tempering Tests

Tempering of	Hardening Temperature, Deg. Fahr., Still Air 1500	1550	1600	1650	1700
	Rockwell Hardness				
None	62	63	63	63	63
300	59	61	61	60½	61
400	58	60½	60	60	60
500	57	59	59	58½	59
600	56	57½	57	57	57
700	55	57	57	57	57
800	54	56	56	56	56
900	51	54	54	53½	54
1000	49	52½	53	53	53
1100	45	48	49	49	48
1200	37	39	39	40	39
1300	27	28	28	28	28

Protective Compound For Stainless Steel

A METAL protecting compound to be used in conjunction with ordinary wrapping paper for the protection of stainless steel sheets and materials during storage, fabrication and shipping has been announced by Paisley Products, Inc., of Chicago and New York City.

According to the manufacturer, this new compound is brushed on the metal and the paper is spread over the coating; or the paper may be coated and smoothed onto the metal. It is claimed the paper will lay smooth, effectively protecting the metal against abrasion and scratches during handling; also, the flat paper covering is said to afford an excellent surface for lay-out work.



Holfcroft gas-fired, continuous annealing furnace recently placed in operation by the General Malleable Corp.

Alemite Line Augmented By A New Rubber Lubricant and Preservative

A rubber lubricant and preservative has been added to the line of automotive products marketed by the Alemite division of Stewart-Warner Corp. It is intended for the preservation of rubber shackles, mountings, grommets, linkage, insulation strips, and all rubber parts exposed to wear, weather or friction.

TABLE III
Distortion in Heat Treatment

Location	Dimension in Inches Annealed	Change, in Inches per Inch Air Hardened at 1550 deg. Fahr.	Air Hardened at 1550 deg. Fahr. Tempered 300 deg. Fahr.
A	4.99825	0.00067	0.00040
B	2.89875	0.00095	0.00077
C	0.50075	0.00210	0.00190
D	1.89625	0.00102	0.00102
E	1.00150	0.00013	0.00038

Non-poisonous, non-caustic, and harmless to upholstery or car finish, the Alemite rubber preservative is said to help prevent rubber from drying out and acts as a deterrent to any corrosive action caused by contact or exposure to oil or gasoline.

Further claims for the new product include high surface tension, adhesiveness, and economy. The liquid is also relatively non-volatile.

Easily Preformed, High Impact Phenolic Molding Material Is Announced By Durez

An easily preformed, high-impact phenolic molding material has been developed by Durez Plastics & Chemicals, Inc., North Tonawanda, N. Y. This molding compound, known as Durez 1900 Black, is said to deliver an unusually smooth finish for a standard high-impact type.

The manufacturer states that the particle size is so controlled that Durez 1900 Black flows through hoppers and automatic feeding devices easily. For this reason it has been found suitable for many parts requiring a high-impact material which had previously been considered impractical for molding.

General Malleable's New Holcroft Furnace Shortens Annealing Cycle

A NEW gas-fired, continuous annealing furnace which reduces the annealing cycle from 10 days to 30½ hr. has been placed in operation by the General Malleable Corp., Waukesha, Wis. The unit is a product of Holcroft & Co., Detroit, Mich. Built at a cost of $60,000, the furnace is 70 ft. long, 12 ft. wide, 13 ft. high, and has a capacity of 12 tons of castings per day on the present cycle.

The furnace consists of a gas tight welded steel case, insulated with light weight insulating fire brick. All metal within the furnace as well as trays and containers are of chrome-nickel alloy suitable for the high operating temperature. At each end is a tightly closed chamber with inner and outer doors, at least one of which is always closed.

The operator, having loaded three containers with castings, rolls the trays with their loads onto a transfer car which also weighs the charge. He then rolls the transfer into position in front of the furnace and pushes the load onto the loading platform. A similar charge of three trays is in the charge end vestibule and its doors are tightly closed.

Every one and one-half hour a time clock makes a contact and automatically sets the discharge and charge mechanisms into operation. First the inner discharge door opens, a puller pulls a set of three trays into the discharge end vestibule and the inner discharge door closes. Immediately the inner charge door opens, the pusher pushes a set of three trays into the furnace and moves the train of trays forward two feet and the inner charge door closes, completing the cycle.

The operator now has time to pull his annealed charge of three trays out of the discharge vestibule, dump the containers, returning trays and containers over gravity rolls to the charge end for reloading.

The furnace is heated with artificial gas by means of 27 radiant tube heating elements, arranged over and under the trays, and individually equipped with burners. Tubes are arranged in six groups, each of which is controlled by a thermocouple, an automatic valve and a recording temperature controller to hold a certain predetermined temperature to plus or minus 10 deg.

The first two groups of burners bring the charge gradually to 1750 deg. Fahr., the next two hold it there for 19 hr. A fifth zone, provided with an automatically controlled blower, then cools the charge (also by means of tubes) to 1400 deg. Fahr., while the last two groups of burners supply just enough heat to permit the charge to cool slowly and uniformly to around 1300 deg. Fahr. and then quickly to around 1000 deg. Fahr before the charge is withdrawn.

The New Steel Making Process -- "Pluramelt"

Details of a new steel making process known as "Pluramelt," in which special steels are melted and joined to low-cost steels in ingot form, have been announced by the Allegheny Ludlum Steel Corp., Pittsburg, Pa. Research which culminated in the new product was undertaken originally by Robert K. Hopkins, director of metallurgical research for the M. W. Kellogg Co., Jersey Cty, N. J. Mr. Hopkins had numerous conferences on the subject with the Allegheny Ludlum research staff and as a result the steel company decided to participate in the further development. Now, a new plant at Brackenridge, Pa., is in commercial operation under exclusive license from the M. W. Kellogg Co. under the Hopkins patents.

Pluramelt in its numerous analyses is the product of an electric furnace melting technique, as a result of which all of the special composition materials and a small part of the low-cost materials are melted and integrally joined during the operation. The furnace proper is radically different from the conventional type of electric furnace, in that the functions of steel making and of the mold are combined.

Experience so far has been limited to Pluramelts of stainless alloys (high chromium-iron and chromium-nickel-iron alloys) on soft or medium steel, and tool steel types on soft steel bases, but it seems very likely that the commercial success with these materials may be duplicated with any other alloy that can be melted in an arc furnace. High carbon steel can be added to mild steel (or vice versa), the low alloy S.A.E. steels used in any desired combination, hard alloys or tool steels for wear resistance can be put on slabs, rails, roll cylinders, or wheel treads. Likewise the high nickel alloys can be so treated. The base metal can be covered on both sides and triple or more layers made of any desired proportionate thicknesses.

Thus far the materials which have been successfully produced are Allegheny Metal 18-8S (low carbon, 18 per cent Cr, 8 per cent Ni); the same with columbium, molybdenum or both; low carbon 13 per cent chromium steel; and various tool steel compositions for the alloy portion, and low carbon and carbon-molybdenum steels for the massive portion. In the majority of cases the massive material is plain low carbon steel.

Ingots have been produced of three compositions integrally joined. These ingots have been processed into plates and sheets down to 24 gage. Pluramelt wire also has been produced.

Extrusion Process Opens Up New Field for Plastic

An extrusion process for molding plastic material in many forms and any desired lengths has been developed by the Detroit Macoid Corp., Detroit. Its physical characteristics are based upon the use of a new thermo-plastic molding compound, Tenite II, known chemically as Eastman Cellulose Acetate Butyrate, a product of the Tennessee Eastman Corp. Tenite II is claimed to have the advantages of the familiar cellulose acetate and cellulose nitrate compositions but has particular utility where it is essential to have resistance to distortion under the effects of heat and humidity.

One producer of motor vehicles has employed a decorative molding strip for interior trim, using the new material in the form of strips tacked into the door trim under the garnish molding. Other automotive applications include exterior scuff plates, garnish molding, inserts in garnish molding, and radio grilles woven from extruded strands.

Phelps Develops Improved Copper

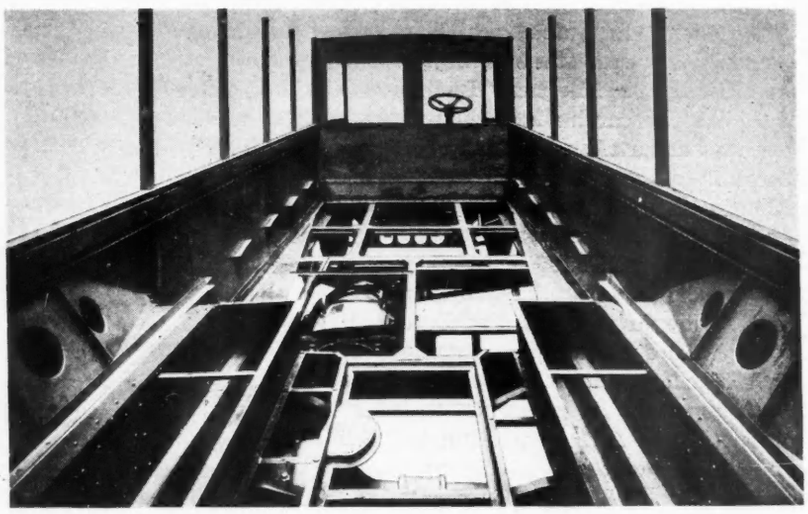
A new type of copper, product of a 10-year research and development program costing well into seven figures, was announced early in March by Wylie Brown, president of the Phelps Dodge Copper Products Corp. Greater conducting power, ductility, fatigue resistance and surface quality are claimed to be the outstanding characteristics of the modernized metal.

The improved copper is made under a patented process without melting from electrolytic cathode copper, which is plastically converted by tremendous pressure in a reducing atmosphere at elevated temperature into smooth, dense copper bar, rod, strip or other desired commercial shapes.

One of the principal difficulties with copper windings in motors and transformers is the existence of surface imperfections in the copper which by vibration and magnetic stress eventually penetrate the insulation and cause failure by short circuits. These imperfections may originate in defects arising in the casting process. In addition, slivers and oxides are developed during the process of hot-rolling the cast copper bars into rods, and are more or less inherent in the hot-rolling process. The new method eliminates not only the casting process, but also hot-rolling. It has, in consequence, made possible the production of a sliverless and dustless copper surface heretofore attainable only in the laboratory, according to the corporation's statement. It is further stated that ductility far greater than ordinary copper permits sharper bends, easier forming and drawing. The metal is said to approach the malleability of gold.

One of a fleet of private hire buses built by Leyland for London Transport

Building



Lower deck framing and side panels of Metropolitan-Cammell unit-constructed bus

By M. W. BOURDON

RECURRING threats of war, the outbreak of war, and the eventual cancellation of the year-end commercial motor transport exhibition in London have not prevented appreciable progress being recorded during the past 12 months in the development of British bus design. Certainly, the pre-occupation of the majority of manufacturers with government work since the war commenced has caused many new models and new features for existing types to be put into "cold storage," instead of into production. But particulars of as many others had already been announced in anticipation of their initial public display at the show, and a review of these will not be misleading as an indication of the lines upon which British practice has been developing in response to or in advance of operators' demands.

First of note is a trend, in its early stages, toward the adoption of an integral construction of chassis and bodywork. This is not evident in the same form as the true "chassisless" passenger car; there are no elaborate pressings to form part of the body and displace the conventional chassis members by carrying the engine and transmission and locating the axles. The usual conception is reminiscent of the Morris, Hillman and Austin cars with integral chassis and body; that is to say, there is distinct evidence of a chassis frame during the early stages of erection, but it serves eventually as a foundation for, and part of, a specially devised body, the two thereafter becoming a permanently integral unit of less weight than the orthodox construction. In one case, it is said, 700 lb. is saved.

As at present announced, this system of construction is applied chiefly (but not solely) to the electric-trolley type of bus, which in England has largely displaced the electric tramcar and is now a standard type produced by many bus manufacturers, additional to gasoline and Diesel engined models. The integral construction, for example, is used for a fleet of 175 six-wheel 70-seater double-deck trolley buses built by the Metropolitan-Cammell Co. for the London Passenger Transport Board; also in English electric-trolley buses supplied to London Transport. In both cases the makers of A.E.C. gasoline- and oil-engined buses collaborated by supplying certain standard components, such as axles, springing and steering.

Experimental use by London Transport also has resulted in Leyland producing integral-constructed buses with an under-floor engine. The six-cylinder power unit is the standard Leyland 525 cu. in. Diesel engine suitably modified for mounting horizontally amidships, with its crankshaft along the center line

Integral Body and Chassis

of the chassis. Access to the injectors, oil pump unit, valves and other auxiliaries is gained by the removal of detachable body panels on the right-hand side. A further innovation in British practice in this case is compressed-air operation of the four-speed pre-selective transmission and provision whereby the gears cannot be engaged unless there is sufficient air pressure in the storage cylinders for the application of the (air-operated) brakes. Engine and transmission are slung from the chassis and the body foundation, and can be lowered for servicing.

A new type of A.E.C.-built bus will form the standard type of London Transport for the next few years, it is expected. With a conventional chassis construction and separate body, it is a four-wheel double-decker for 55 passengers and is powered with the new A.E.C. direct-injection Diesel engine flexibly mounted farther forward than in earlier practice. This bus has the new compressed-air control of the four-speed transmission (also pre-selective in combination with a "fluid flywheel") and air braking. In this case air pressure is used also to operate the chassis-lubrication system, which functions when the brake pedal is depressed.

Austin has entered, and Morris-Commercial has re-entered the bus field with a two-axle, single-deck model. The Austin, it may be said, is the only British bus with synchromesh transmission, a four-speed type with synchromesh on all except bottom gear.

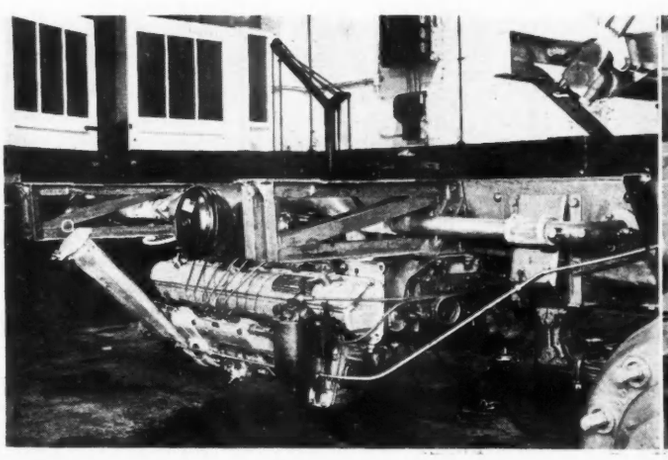
Other makers who would have exhibited new models at the London show are Dennis and Thornycroft, with chassis for single-deck bodies of up to 32-passenger capacity. The Dennis is offered with either a four-cylinder gasoline engine of 229 cu. in. displacement, or with the Perkins 290 cu. in. six-cylinder Diesel, of which drawings and particulars appeared in AUTOMOTIVE INDUSTRIES of Dec. 1 last. The option of a gasoline or a Diesel power unit is also attached to the new Thornycroft; the Diesel in this case is of Thornycroft make, a 244-cu. in. Six with a bore and stroke of 3½ x 4⅛ in.

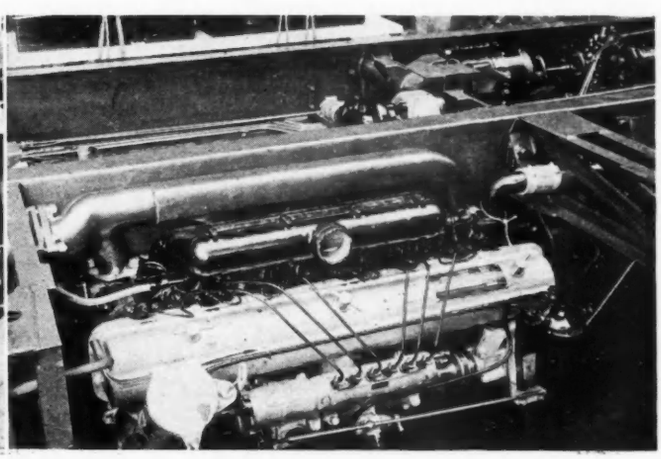
Commer with new single-deck chassis is yet another maker offering an option on gasoline and Diesel engines, the Diesel, of course, being higher-priced. Commer also uses a Perkins Diesel, the line of which make now extends to a Six of 4⅜ x 5 in. (452 cu. in.), on the same lines as the 290 cu. in. model referred to above. The Commer gasoline engine is the first in British bus practice to have high-voltage ignition with double-width spark gaps. This bus, like certain new or revised models of other makes, has hydro-mechanical brake operation; in this case the Lockheed system is combined with Bendix-Cowdrey bi-sector (wedge-actuated) shoes.

A two-leading-shoe braking equipment has commenced to find favor and would have been found on a number of new buses at the canceled London show, either Girling, Lockheed or Bendix. Girling has introduced a hydro-mechanical system in which the front brakes are hydraulically operated, while the rear ones are purely mechanical. Another development in braking is the Lockheed-Gates booster, a mechanical (plate clutch) servo coming into effect when fluid pressure is generated by pedal operation; in proportion to light pedal pressure the clutch provides the effort normally applied to the master cylinder by direct pedal pressure alone.

(*Turn to page* 292, *please*)

Two views of an under-floor Diesel engine of Leyland chassis for unit-construction single-deck bus





MEN and MACHINES.

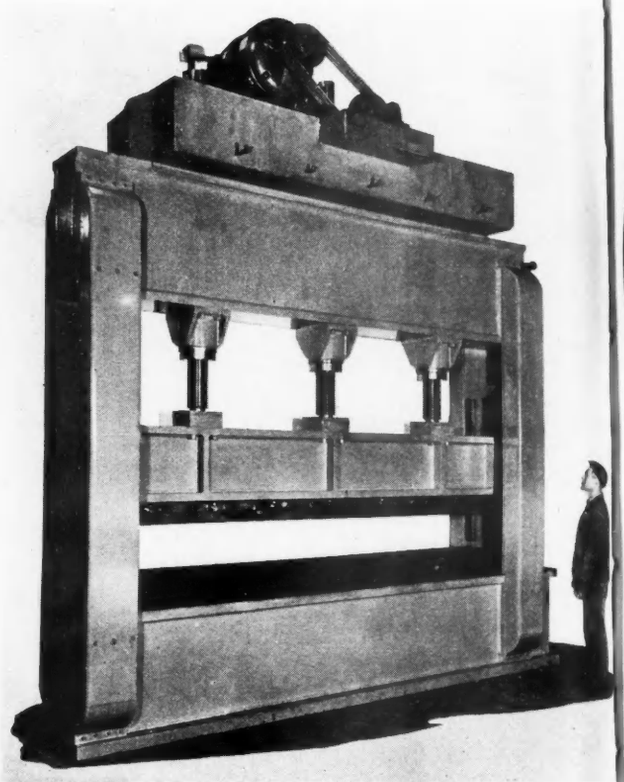
AN improved automatic hob sharpening machine for precision re-grinding of hobs and formed milling cutters has been developed by the Barber-Colman Co., Rockford, Ill. It is designated as "4HS" and will accommodate sizes up to 10-in. diam. and 12-in. face. Among several unusual elements incorporated in the design are a hydraulic table drive which affords instant control of traversing speed, and a spiral wheel dresser which enables the operator to grind true radial faces on high-spiral hobs or formed cutters. In most other respects the machine is similar to the company's No. 3 model, except that it is larger and more ruggedly constructed.

Adjustable speed of traverse offers some interesting advantages in hob sharpening work. It has been found, for instance, that the life of the hob between grinds can be increased by giving the faces of the teeth a finer finish. This is accomplished by slowing down the table speed on the last circuit of indexing. The smoother surface offers less resistance to the curl of the chip during the actual hobbing operation and thereby reduces the heat of friction generated and consequently cuts down burning of the cutting edge. The result, as has been demonstrated in actual practice in the plant of a leading tractor manufacturer, is to enable hobs sharpened in this way, with finer finish on the teeth, to cut a greater number of gears before resharpening is required.

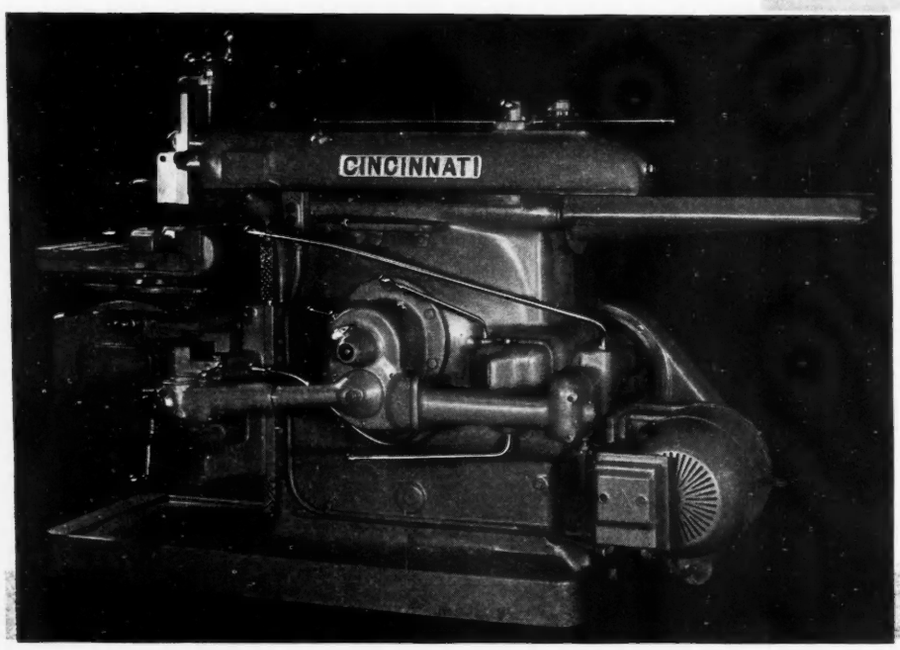
The principal advantage of the adjustable table speed is that it permits the operator flexibility of control and enables him to change the table speed at any time. This should result in noticeable production savings, as well as greater accuracy and increased operating efficiency.

The manufacturer of the machine points out that the ability to adjust the table travel will improve the economy of operation of this model over the older types by making it possible to use short table strokes where the size of the work will permit.

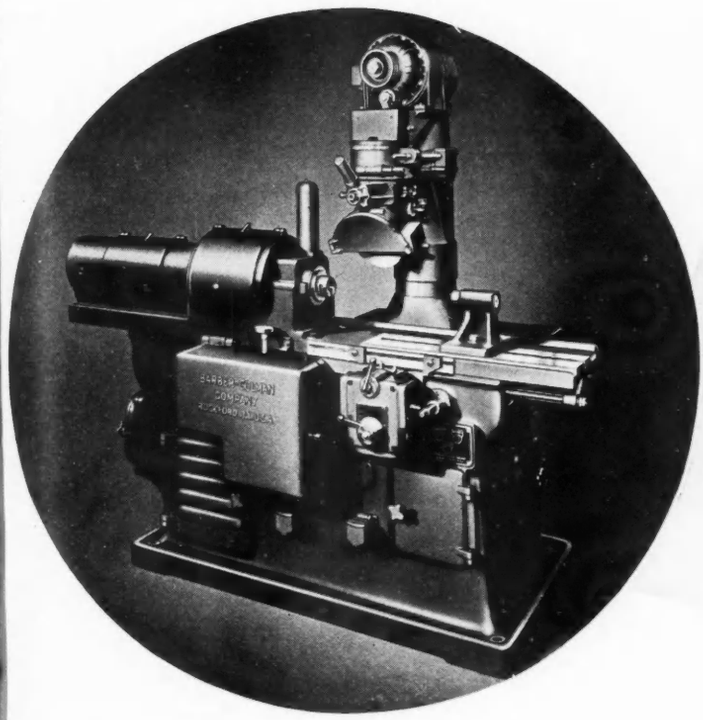
On the new "4HS" an upright supports the grinding

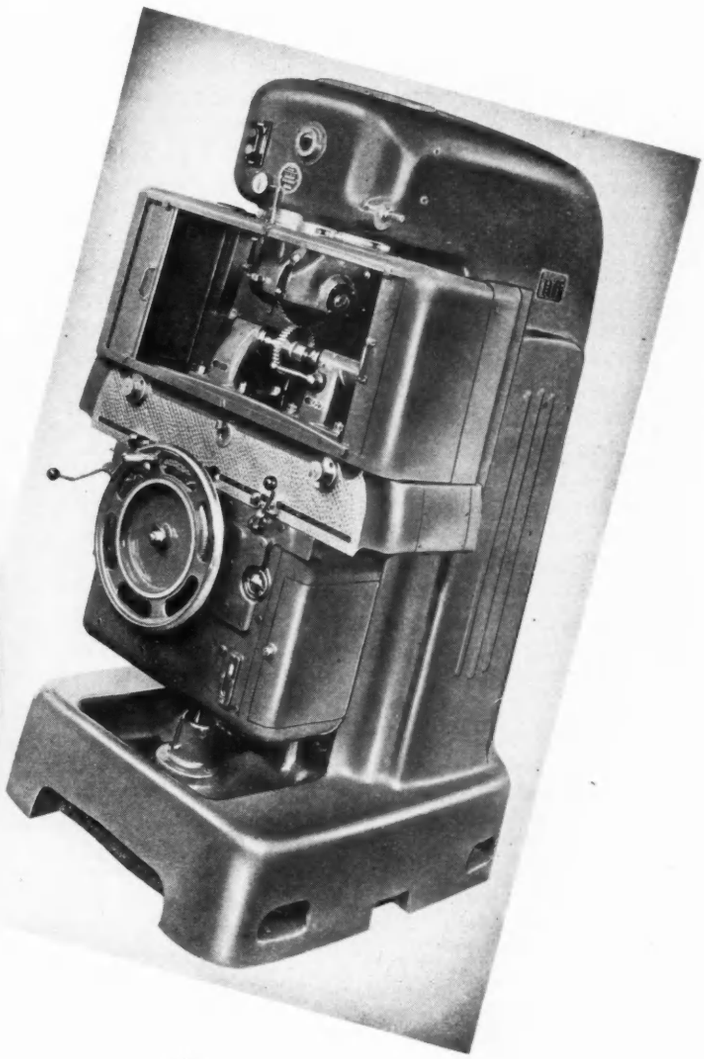


(Above) Contract Engineering Corp.'s "Bull Press" designed for operations, such as bending, forming, straightening and horning.



(Left) Improved 24-in. power rapid traverse shaper manufactured by the Cincinnati Shaper Co. Rail clamping, also rail elevating and lowering controls are now conveniently located on the operator's side of the machine. Neoprene wipers for ram and rail bearings provide more efficient retention of oil and added protection of bearing surfaces.





(Circle) The improved Barber-Colman automatic hob sharpening machine

(Right) Extra heavy-duty "Red Ring" shaving machine developed by the National Broach and Machine Co.

wheel head and its individual motor drive. The motor spindle is set on an angle to bring the rear convex cutting face of the wheel in a vertical position where it meets the work. It is possible to raise or lower the entire wheel head to suit the size of the work, and the wheel spindle can be run back as the wheel is worn and re-dressed. For helical work, the wheel can be swung, about a vertical line which intersects the work centerline, up to 30 deg. either side of zero. A straight-line wheel dresser is built into the wheel guard and is used to dress the grinding face of the wheel for straight-gash and slight spiral hobs; traversing the dresser head automatically puts a straight face on the wheel which is truly radial to the work centerline. Extra equipment also includes the spiral generating wheel dresser.

The table of the machine carries the work between centers and reciprocates back and forth to pass the tooth faces across the fixed-position grinding wheel. This table also contains an automatic mechanism for "indexing" the work. A part of the index mechanism is a feed control which advances the work, after a complete circuit of indexing, so that a desired further amount of metal will be removed from the tooth faces on the next circuit. Spiral gashed hobs must be rotated accurately as part of a turn during the traversing stroke; there is an adjustable sine bar in the base of the machine which actuates a rack and pinion in the index mechanism to obtain this result.

The automatic index mechanism in the index drive head on the left-hand end of the table consists of a latching stop unit which engages successive notches in the periphery of an accurately hardened and ground index plate. A separate plate containing the proper number of notches is used for each different number of gashes in the work. As the over-and-back cycle of the table is completed, the index plate is released, then rotated by a special drive until the stop latches into the next notch, by which time the next stroke begins. There are change gears to permit alterations in speed of the rotating mechanism in order to obtain a speed of operation commensurate with the size and length of the work and the time in the cycle available for indexing.

THE "Bull Press," a metal working press designed for bending, forming, straightening, horning, etc., is a new development of the Contract Engineering Corp., Cleveland, Ohio. The unit illustrated herewith has a capacity for bending a 10-foot length of ½-in. mild steel plate having an ultimate strength of 60,000 lb. per sq. in. to an angle of 90 deg. on a six-inch V die block. Beams and columns have a nominal strength of 400 tons.

Power for the Bull Press is supplied by a 25 hp., three phase, 60 cycle, 220 to 440 volt, special hoist type motor manufactured by the Lincoln Electric Co., Cleveland, Ohio. The motor is equipped with an extended shaft for a brake. Power is applied through a standard V belt drive to a countershaft which drives a spur gear train and moves the screws. Two speeds permit movement of the ram in either direction at the rate of 16 in. or eight inches per minute.

According to the manufacturer, the simplicity and sturdiness of the press were made possible through application of arc welded construction. Beams, columns, ram and base are hollow sections fabricated of steel plate. All welding was done by the shielded arc process with equipment supplied by the Lincoln Electric Co. In addition to being used in building the machine structure itself, arc welded steel construction was employed in fabricating the drive gears. High carbon steel was used for the face rings and the pinion teeth were all flame hardened.

"REVOLVING Spindle Headstock Equipment" is the latest development brought forth by the Brown & Sharpe Mfg. Co., Providence, R. I., and is adaptable to the company's Nos. 20, 22 and 23 plain grinding machines. It is designed for use when the requirements of the work call for a chuck, spring collet or driving center and when full table capacity of the machine is not required and, therefore, the installation of a motor-driven revolving spindle headstock is not warranted.

The revolving spindle headstock equipment consists of a spindle mounted on sealed pre-loaded precision ball bearings and carried in a casting which is clamped in position on the table ways at the right of the headstock of the machine. The spindle is driven directly by the work driving plate of the regular headstock. Use of this unit reduces the length capacity of the machine by 14 in.

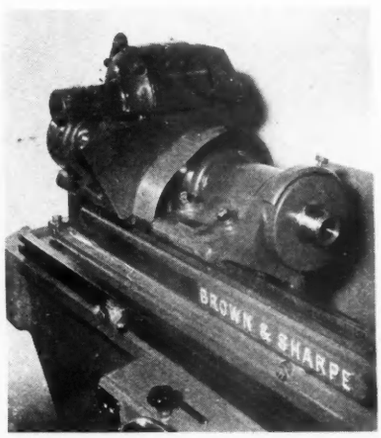
The front end of the spindle is threaded, four R.H., National Standard, 2¾ in. diam. It has a No. 11 B&S taper hole; and the straight hole through the spindle is 1 1/16 in. in diam.

THE Kent-Owens Machine Co., Toledo, Ohio, is making a new milling machine with a horizontal spindle and vertical feed to the head which is especially suitable for milling Woodruff keyways and performing similar operations on long parts. An extra long table is provided to furnish adequate support for the work throughout its entire length.

The illustration of the machine on this page shows a long shaft in which several Woodruff keyways must be milled in alignment with each other. This shaft rests in vee blocks and against a stop at one end to properly determine its position. A clamp is also provided for securely holding it in place.

The table is advanced lengthwise through a rack and pinion by means of the large hand wheel. Dogs are properly set along the face of the table which cooperate with the quick-acting flag stop to position the work for each successive keyway.

After the work has been properly set for a given keyway, the vertical movement of the head is entirely automatic. This movement is obtained hydraulically and adjustable dogs permit any desired combination of rapid traverse and feed within the limits of the machine. It is simply necessary for the operator to press down the starting lever which causes the cutter to lower rapidly to the work, then mill into the work at the proper feed rate and then to reverse automatically and return to the upper position where it stops. This cycle is repeated as the operator advances the table to the proper position for each succeeding keyway.



Brown & Sharpe revolving spindle headstock equipment.

The machine is driven by a standard foot mounted, ball bearing motor mounted at the rear of the machine. Between the motor and the cutter there are only two gear contacts, one of which is a pair of pick-off gears providing a spindle speed range of 100 to 1335 r.p.m. with a 1200 r.p.m. motor. With the hydraulic actuation of the head movement, an infinitely variable feed rate ranging from ¾ in. to 80 in. per min. can be obtained and provides a constant rapid travel rate of 300 in. per min. Changes in feed rate are obtained by simply adjusting the dials at the front of the machine.

In the set-up illustrated, a special automatic clamping member is mounted on the overarm. This is a spring backed clamp which contacts the work shortly before the actual milling begins so that the work is securely held near the point of milling throughout this operation.

Though the illustration shows the particular application of milling Woodruff keyways in long shafts, many similar operations can be done with this arrangement. Notching, milling of flats, spotting and other operations on structural shafts and other long parts can be handled with equal facility.

AN extra heavy duty "Red Ring" shaving machine has been announced by the National Broach & Machine Co., Detroit. The frame of the new unit is of the heavy "C" type—one piece, which avoids the "spring" found in bolted assembled frames. This construction gives solid support to the cutter head, and to the lead screw under the knee. Rigidity is so great that cuts of 0.002 in. over pins, which is approximately 0.0003 in. on a side, can be taken, with exact measurements after each cut.

The machine makes use of a gashed helical gear form tool in mesh with the work gear, with the axes of work gear and cutter crossed at an angle—usually 10 to 15 deg. The cutter gear drives the work gear, as the latter is traversed back and forth across the cutter. Stock is removed in fine, hair-like shavings, with a true cutting action. Tooth profile, index, eccentricity and helical angle are corrected, and a bright, smooth tooth surface is produced. Horizontal serrations (washboard effect) are eliminated. Profile is corrected by the generating action to within 0.0001 in. of that desired.

This machine also provides for crowning gear teeth by means of a cam operating the table. The adjustable cam tilts the table slightly, making it follow a curved instead of a straight path. This makes the teeth thinner by a slight amount at the end than the middle. As a result, the ends of the teeth are relieved from bearing against the mating gear, avoiding edge bearing of gears. Bearing is taken through the center where teeth are strongest. Breaking and chipping of tooth corners, so frequent in helical gears, are avoided.

The knee of the new Red Wing is supported by a 2½-in. feed screw, providing positive location, and rigidity. The cutter head has solid support on both sides of the cutter, to prevent spring. The work table is of heavy box construction, 7½ in. deep, and has an upper surface 10 in. by 35 in.

All moving parts in the knee have force feed lubrication. Cutter spindle is 2½ in. in diameter, for ample rigidity. Individual motor drives are used on cutter spindle, table and oil pump. Automatic feed box has been redesigned so that quick settings of 0.001 in., 0.002 in., 0.003 in. or 0.004 in. feed can be set by a knob located on the outside of the knee. Automatic feed is cut in or out by a second lever on the knee.

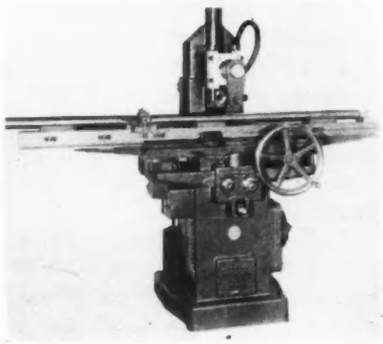
The cycling of the machine, including feed, and the required number of strokes, can be set for automatic operation. In this case the operator need only mount the gear, start the machine, and it will stop when the gear is completely processed.

ADDITIONAL new product developments recently brought to the attention of *Men & Machines* are as follows:

Pocket gage for checking fillet welds of the following sizes: 5/16 in.; ⅜ in.; ¼ in.; 5/16 in.; 7/16 in.; ½ in.; and ⅝ in. *General Electric Co., Schenectady, N. Y.*

Precision limit switch for actuation by rotating or sliding cams. Roller actuator is adjustable through arc of 225 deg. Model LK-2. *The Micro Switch Corp., Freeport, Ill.*

Dynamic wheel balancer with neon light indicator which shows where weight is to be applied, and a pointer indicator which shows the amount of weight needed. *Bendix Products Division of Bendix Aviation Corp.*



Kent-Owens milling machine with vertical feed for handling long parts.

Centerless grinder rests for any type of machine or grinding operation. Faced with Tantung, patented alloy composed of hard particles of tantalum and tungsten carbide, uniformly distributed and firmly embedded in a strong, tough matrix. Facing affixed to steel supports by special brazing process. *Fansteel Metallurgical Corp., North Chicago.*

Electric hammer, the "Thor-Nado," adapted to heavy duty applications, including star drilling, channeling, chipping, cleaning, scaling, cutting, gouging, beading, caulking, and seaming. Capacity in concrete, limestone and brick is one inch. Length, 13½ in.; weight, 14 lb. *Independent Pneumatic Tool Co., Chicago.*

Pneumatic tire designed for use on a swivel caster unit on industrial trucks. *General Tire & Rubber Co.*

Air transformer which will pass air for two production spray guns in continuous and simultaneous operation. Handles in excess of 50 cu. ft. of air per min. Type HLC. *The DeVilbiss Co., Toledo.*

Grinding disc with unusual heat resistance resulting from use of special binder. Binder said to stay firm and hold special aluminum oxide grit in cutting position at temperatures up to 1800 deg. Fahr. *Abrasive Products, Inc., South Braintree, Mass.*

Medium-pressure oxy-acetylene blowpipe for welding light-gage metal and a cutting attachment for cutting iron and steel up to one inch in thickness. Suitable for all applications in which metals up to ⅜ in. in thickness are to be joined. Known as Prest-O-Weld, Type W-109. *Linde Air Products Co., unit of Union Carbide & Carbon Corp., New York.*—H. E. B., Jr.

Publications Available on Machine Tools and Allied Equipment

Two new circulars have been issued by Continental Machines, Inc., Minneapolis, Minn. One of these describes the complete selection of Doall precision **saws** supplied by this company; the other covers the 21 precision **file bands** which the company manufactures in widths varying from ¼ in. to ½ in.*

Single and double slide **vertical surface broaching machines** built by the Oilgear Co., Milwaukee, Wis., are illustrated and described in two new bulletins, Nos. 23001 and 24001.*

A new self-contained, electro-pneumatic **forging hammer** developed by the Chambersburg Engineering Co., Inc., Chambersburg, Pa., is described in the company's bulletin No. 1275.*

The Speedmaster Co., Minneapolis, Minn., has issued a four-page bulletin which discusses advantages and applications for the Speedmaster **variable speed pulley.***

Link-Belt Co., Indianapolis, Ind., has published folder No. 1804 which deals with **bronze drive and conveyor chains** for resisting the destructive effect of organic and inorganic acids.*

A data book containing considerable information on construction, capacities and applications of **Morse Roller Chain** has been issued by the Morse Chain Co., Ithaca, N. Y. It is designated as No. R-54.*

A turntable designed to simplify the **spot welding of radiator grill assemblies** is described in "Welding and Punching Pictorial No. 5" issued by the Progressive Welder Co., Detroit.*

The complete line of **automatic metal sawing machines** manufactured by the Peerless Machine Co., Racine, Wis., is described in bulletin No. 50.*

Universal manufacturing gear hobbing machines built by Gould & Eberhardt, Newark (Irvington), N. J., are described in bulletin No. 218.*

Rockford Machine Tool Co., Rockford, Ill., has issued a new circular on its improved series of 16-in. to 28-in. Hy-Draulic **shapers.***

* Obtainable through editorial department, AUTOMOTIVE INDUSTRIES. Address Chestnut & 56th Sts., Philadelphia, Pa. Please give date of issue in which literature was listed.

PRODUCTION LINES . . . .

Steel Forgings

A triumph of research in the drop forging industry is to be found in the almost amazing growth of drop forging application in large aircraft. January issue of *Drop Forging Topics* comments on the fact that over 1700 individual forgings are used in the huge Model 28 flying boat built by Consolidated Aircraft Corp. These ships are identified as the U. S. Navy PBY's which made the remarkable mass flights over the Pacific recently. It is of interest to note that the new type of forgings provide greater strength and reliability with less weight. In addition, machining costs have been greatly reduced by the use of precision dies.

On Cutting

For the information of those who have been interested in the activity of the Independent Research Committee on Cutting Fluids, we are glad to advise that the report on machinability, together with recommended cutting fluids for common operations, will be published very shortly. This project promises to be one of the most important contributions to the literature in this sphere of machine shop management. Next project undertaken by the Committee is a study of commercially available cutting Fluids, leading to a standardization of nomenclature and identification.

Drawfinish

An entirely new avenue for cylinder bore finish is being explored by several important organizations. The new theory, developed independently by these experimenters, is that the most acceptable type of finish within the cylinder barrel is one in which the characteristic finish lines run vertically, i.e., in the direction of piston travel. Micromatic Hone has developed a new form of honing tool which produces this type of finish and, for the moment, they call the process "Co-Directional Drawfinish." The tool is so arranged as to produce the roundness, axial alignment, sizing, etc., characteristic of the Micromatic process. As the final step, an external machine adjustment stops all hone movement except reciprocation, thus producing the vertical finish lines.

Ups Die Life

In its recent work in industrial applications of colloidal graphite, Acheson Colloids reports an interesting experience with forging dies. In one particular case the life of a heavy forging die was increased almost phenomenally by the use of colloidal graphite. We are told that this job seemingly defied solution with conventional compounds and required constant attention. Another virtue of the Acheson treatment is that the graphite produces a corrosion-resistant coating which increases the shelf life of expensive die equipment.

Air Conditioning

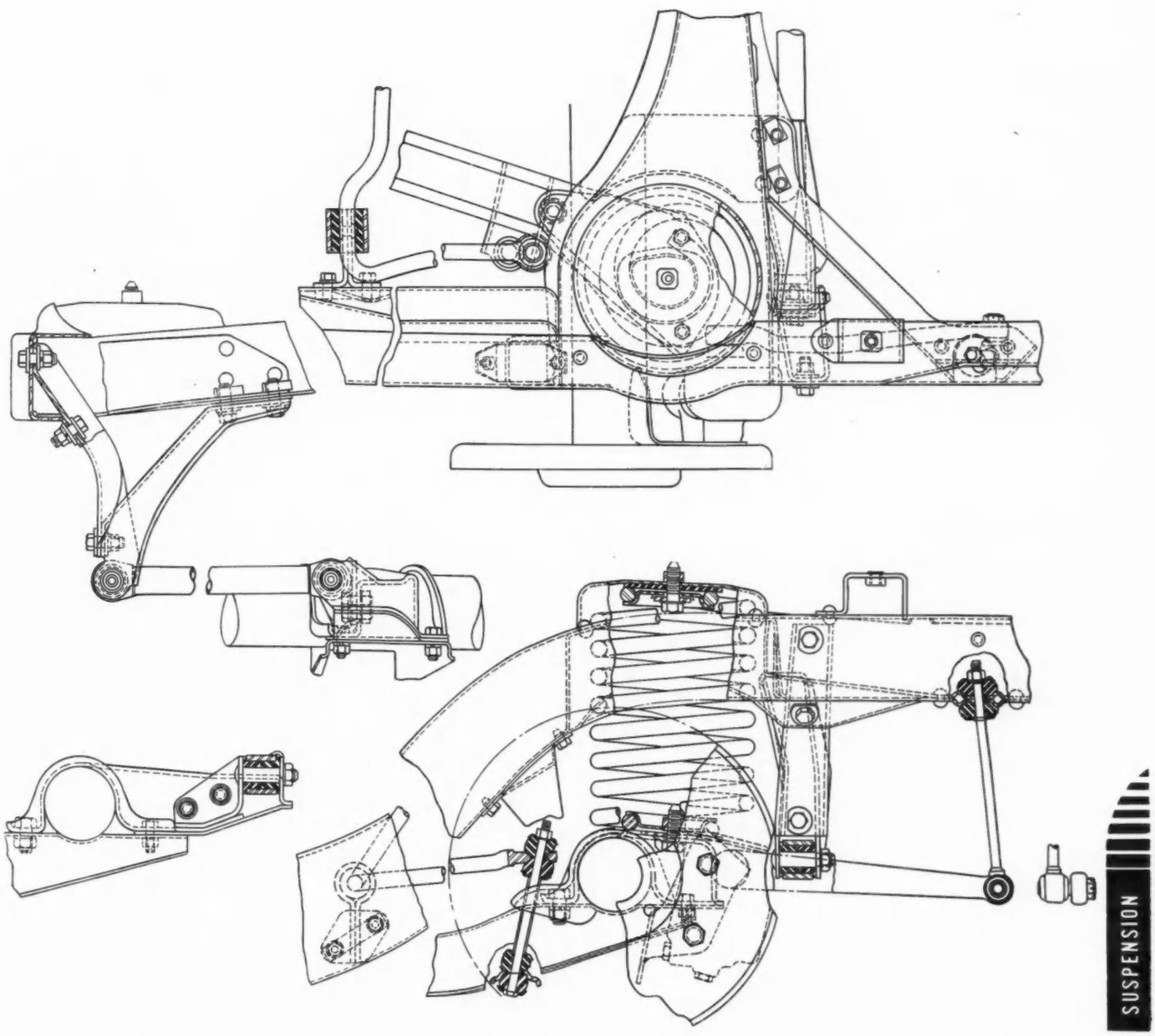
Conversation with certain engineers indicates that our industry needs a definition of air conditioning as applied to automotive vehicles. The term has been loosely applied by the advertising-minded and even by engineers. An acceptable definition will be urgently needed in the near future, what with the increasing activity along this line in passenger cars and buses. It seems only logical that the SAE should adopt a definition, patterned perhaps, after the accepted terminology in the refrigeration field as established by the A.S.H. & V. E.

Gasoline Volatility

An understandable treatment of the relation of the volatility of gasoline to the performance of motor cars and trucks will be found in the December issue of *Lubrication* (The Texas Co.). This Texas series has proved to be both educational and practical and we urge you to get on the mailing list. We'll be glad to help.—J. G.

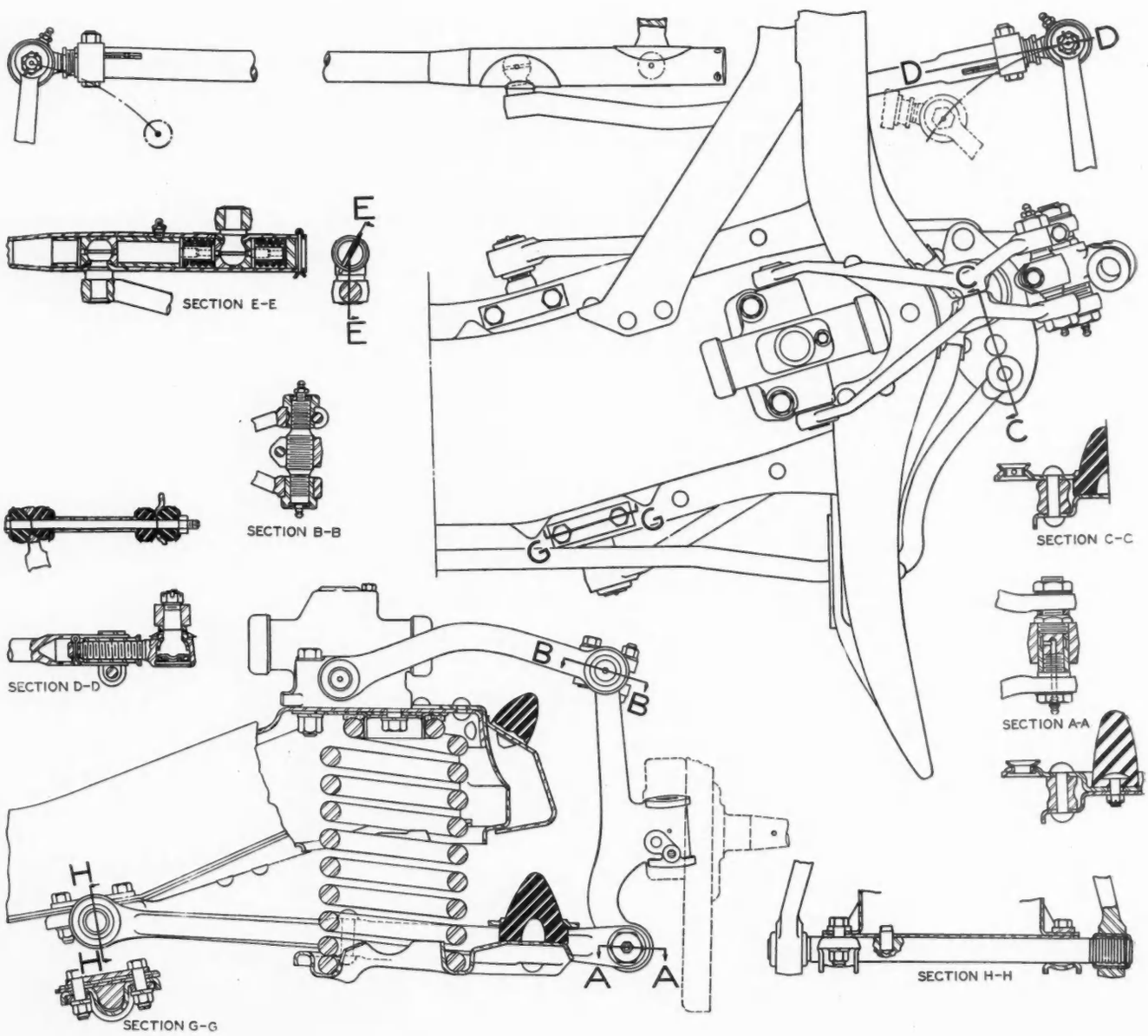
BUICK REAR SUSPENSION ON COIL SPRINGS

The drawings below show a plan view and a side elevation of the coil-spring rear suspension of Buick passenger cars. In addition to the suspension proper the drawings show the shock absorber with its arm and link, the transverse radius rod, the longitudinal radius rod (on an extension of which the coil spring is mounted), and the torsional equalizer bar. It will be noted that the links of the equalizer bar and shock absorber are mounted in rubber at both ends. The details on the left are of the transverse radius rod and its mountings. This rod extends between a bracket depending from the frame at the left and a pin secured to the spring seat on the axle at the right. Its chief object is to prevent swaying on turns.



BUICK INDEPENDENT FRONT SUSPENSION

Below are shown two assembly drawings and numerous details of the Buick independent front suspension (or knee-action). The steering head—to which the steering knuckle is pivoted—is supported from the frame front cross member through upper and lower links. The upper links, which are shorter than the lower ones, are constituted by the arms of the shock absorber. The coil spring has a seat that extends between the two lower links, and it bears against the frame cross member on top. It will be noticed that there are rubber bumpers to limit both the upward and downward motion of the frame with relation to the wheel. The pivot joints of the links are of the threaded type and are provided with lubrication fittings. Some details of the steering linkage are also shown. It will be noticed that the drag link extends across the chassis.



AUTOMOTIVE INDUSTRIES
Just among Ourselves

How Shall We Measure High Anti-Detonating Values?

THE question is sometimes asked, "Can there be fuels of more than 100-octane number?" The answer is that with the present definition of the term one cannot say that a given fuel has a definite octane number greater than 100, although there are fuels which are better from the anti-detonating standpoint than iso-octane, which has an octane number of 100. As officially defined, octane number is the percentage of iso-octane in a mixture of such octane and heptane which exactly matches the fuel under consideration in anti-knock quality when used in a standard test engine under standardized procedure. It is evident that there cannot be more than 100 per cent of one constituent in a mixture, hence no octane determination can give a value greater than 100, even though the test may show that the fuel involved is of higher anti-knock quality than iso-octane.

THERE is some resemblance between the basis for making anti-knock-value determinations and that for temperature measurements. The point on the temperature scale at which ice melts is called 32 degrees; the point at which water boils, 212 degrees, and the portion of the scale between these two points is divided into 180 equal parts. Thus the basic temperature scale extends only from 32 to 212 degrees, yet we have no difficulty in measuring temperatures either lower than 32 degrees or higher than 212. This is due to the fact that air and other fluids, when subjected to temperature changes, expand and contract according to a simple definite law. We take the total proportional expansion between the freezing and boiling points and divide it by 180, and an equal proportional increase in volume from any initial temperature corresponds to a temperature rise of one degree.

IN MEASURING anti-detonating quality we have a somewhat similar relation between the octane number and the highest useful compression ratio (the ratio at which incipient knock occurs). These two characteristics increase and decrease together, but there is no such simple linear relation between the two as there is between temperature change and thermal expansion. There is no limit to the critical compression ratios which can be determined experimentally, but the thought naturally occurs that if we have to go to compression-ratio determinations, why use the octane scale at all? Why not express the anti-detonating value of the fuel directly in terms of its highest useful compression ratio?

The advantage of the octane-number system is that it is what may be called a "zero" system. The fuel under test is matched against a mixture of reference fuels, and the only real measurement is that of the percentage of the high-value reference fuel in the mixture, a method which reduces experimental errors. All other factors which tend to affect the determination of the anti-knock quality are automatically eliminated, as they are the same in the run on the fuel under test as in the run on the mixture of reference fuels.

THE difficulty to which reference is made in the foregoing was foreseen many years ago, as such potential motor fuels as benzol and ethyl alcohol always have been outside the normal octane-number range, and it was suggested that the octane scale might be extended upward by making use of mixtures of iso-octane and pure benzene. The octane number of any fuel matching a definite mixture of these two constituents then would be defined as 100 plus the percentage by volume of pure benzene in a mixture of same with iso-octane which exactly matches the sample. This, however, would seem to involve an arbitrary change in the scale at 100 octane number, as the assumption that pure benzene (which would be rated 200 octane number) is twice as good from the anti-detonating standpoint as iso-octane seems to be wholly arbitrary.

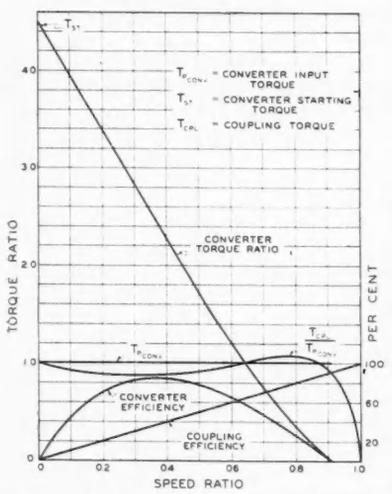
IT SHOULD be stated here that as far as automobile fuel is concerned there is no present reason to worry about inadequacy of the octane scale, for although there has been a rise of a few numbers in the average anti-detonating value of automobile fuels since the octane-number system was introduced, there is still such a wide margin that no difficulty need be anticipated for decades to come. It is different, however, with respect to aircraft fuel. If the rate of progress in such fuel with respect to anti-knock quality that has marked the last few years should continue, the time when fuels better than iso-octane or 100-octane-number will be marketed is not far off. Presumably the new hydrocarbons of remarkable anti-knock qualities to which reference was made in AUTOMOTIVE INDUSTRIES of Feb. 15, are perfectly miscible with hydrocarbons of low anti-detonating quality, such as normal heptane, and by using the latter and the best of the highly anti-detonating hydrocarbons as reference fuels, a new anti-knock scale could be evolved which would cover a wider range of anti-knock values and have uniform divisions throughout.—P. M. H.

Hydrodynamic Power Transmission Units

Hydrodynamic power transmission units for motor cars are discussed in a paper presented before the Society of Automotive Engineers by Prof. W. Spannhake of the Technical College of Karlsruhe, Germany, who many years ago was associated with Dr. Hermmann Foettinger, inventor of the hydrodynamic coupling and the hydrodynamic transmission or torque converter.

Hydrodynamic torque converters are now being used in combination with shift gears, but in place of such combinations it is possible to use multi-stage hydrodynamic torque converters. Such purely hydrodynamic torque converters can be worked out in at least three different ways, as follows:

1. By providing a separate circuit for each stage and engaging the particular stage required under any given set of operating conditions either by filling that circuit with fluid and emptying the others, or by mechanically coupling the rotors of that circuit and uncoupling those of the other circuits.



Characteristics of a single-circuit change gear.

2. By arranging within one permanently-filled circuit as many rows of blades as required to obtain several hydrodynamic gears and changing the working conditions of the different blades, making any row act either as impeller blades, runner blades, fixed guide blades (reaction member) or idling blades.

3. By combining both working processes so that, for instance, one circuit remains filled permanently and operates in accordance with the process described in the preceding paragraph, while one or more other circuits are filled and emptied or coupled and uncoupled as desired.

Hydrodynamic torque converters of several stages are required only for railway cars, locomotives, and heavy military vehicles. For passenger cars and trucks a combination of a torque converter and a hydrodynamic coupling usually meets the requirements as far as range of available torques and speeds is concerned. However, it is to be doubted whether such a combination, which is controlled by filling and emptying the circuits, would be practical for passenger cars and buses, for it would require a complicated installation of pumps, valves and piping, and the change from one ratio to another would not be sufficiently rapid to meet traffic conditions.

These difficulties can be avoided by providing a number of rows of blades in a single hydraulic circuit and so arranging matters that the functions of the different rows can be changed. For instance, a set of guide blades (reaction member) may be provided in the circuit which is held against rotation when it is desired to use the apparatus as a torque converter, and is coupled to the runner on the output shaft when it is desired to use it as a coupling or fluid flywheel.

The graph herewith shows the characteristics of a single-circuit change gear based on the principle described in the foregoing. This graph applies to gears of any size and to any constant input speed. The starting torque T_{st} when the gear operates as a converter is a few per cent lower than that of a pure converter of the same size at the same input speed. The input torque absorbed by the gear when operating as a converter is independent of the output speed. When the combination works as a coupling, the torque transmitted begins at zero output speed and then has the same value as it has under torque-converting conditions. This holds true regardless of the form of blade used. The torque relationships again are the same when the output torque of the converter, because of the increase in output speed, has dropped to the input torque. At this point the guide blades, which so far have been held from rotation, must be connected to the output shaft. From that speed on the combination works as a coupling, the torque increasing first and then dropping to zero as the output speed equals the input speed, that is, when the slip becomes zero.

Coatings for

and Their Effect on

Practically every automobile manufacturer is using coated piston rings at present, and production piston rings are now being supplied by three manufacturers, each using his own coating process. Max M. Roensch of the Chrysler Corp., in a paper presented before the Society of Automotive Engineers, discusses piston ring coatings and their effect on ring and bore wear.

The name Ferrox (the process used for treating one of the three makes of ring used) is derived from ferroso-ferric oxide (Fe_3O_4), the magnetic oxide of iron also known as magnetite. To produce a coating of this oxide on machined surfaces to the desired depth, the parts are subjected to a temperature of approximately 1000 deg. Fahr. in the presence of a suitable gaseous oxidizing agent in a closed chamber. Iron will form a number of different oxides, and to produce the proper compound, with the desired physical attributes and a gradual transition from the surface layer to the core, calls for accurate temperature control, uniform heating, and correct introduction, distribution and maintenance of the oxidizing medium. The formation of the higher oxide hematite must be guarded against, as this forms a soft film lacking adherence and presenting an unsightly reddish color. Since oxygen combines with the iron during the process, there is a slight growth, which must be allowed for in machining.

The Granosol coating consists of an iron phosphate with a high percentage of manganese phosphate. It is softer than grey iron and is sufficiently porous to absorb an appreciable amount of oil. The material is a dielectric and has anti-welding properties, which together with its oil-absorbing properties makes it an excellent scuff preventative. The coating is produced by immersing the part in an acqueous solution of phosphoric acid saturated with iron and manganese phosphates, at a temperature of 210 deg. Fahr. The surface of the iron is attacked by the acid, iron phosphate being formed, hydrogen freed, and manganese phosphate deposited. After the coating has assumed a depth of approximately 0.00025 in. the action slows

Piston Rings

Ring and Bore Wear

down to a very low rate. The etching action of the acid ordinarily would reduce the dimensions of the part, but since the phosphoric acid already is saturated with iron phosphate, the coating does not dissolve, but remains integral with the piece treated. There is a very slight volume increase due to the process, not exceeding 0.00015 in.

Altinizing consists in the electrodeposition of tin on the ring surfaces. Before the plating process is started the surfaces must be cleaned chemically and then acid-etched, to ensure adhesion and prevent blistering of the coating. The plating ordinarily is effected in a bath of sodium-stannate solution, but it can be accomplished also in an acid bath of a tin salt.

The Feritex coating is produced by immersing the cleaned rings in a bath of sodium hydroxide, sulfur and water, which removes certain constituents of the cast iron and produces a slightly porous surface covered with a very thin film of iron sulfide.

Another process produces a coating of zinc and iron phosphates in a bath containing phosphoric acid and zinc phosphate. An activator is always used, and a very fine-grained, soft and porous coating is produced, which is known commercially as Bonderite D. After coating, the rings are dipped in an emulsion of soluble oil and water holding Acheson colloidal graphite in suspension.

The chemical coatings, such as iron-manganese and zinc-iron phosphates, are softer than the raw iron, which also makes possible a quick initial seating. However, while the coating as a whole is soft, the individual crystals are harder than the iron, so if they are scuffed off tehy aid in lapping in the parts.

The metallic coating is the softest of all and therefore facilitates rapid seating. This material, moreover, is quite plastic, which distributes the load over the face of the ring, thus preventing high local pressures that might break the oil film and cause scuffing. The tin itself may act as a lubricant when metal-to-metal contact occurs. The metallic coating also retains a considerable amount of oil, which may help under conditions of boundary lubrication.

A New Dynamic Vibration Damper for Crankshafts

A new type of dynamic vibration damper for crankshafts and a new method of calibrating same (or tuning it to the crankshaft assembly for which it is intended) are described in a pamphlet by H. Bosse (*Die Wirkung von Resonanzdrehschwingungsdämpfern und die Entwicklung einer Maschine zur Prüfung solcher Dämpfer*), published by Verlag Fr. Vieweg, Braunschweig, Germany.

The damper, which is of the dynamic type and in the critical speed range vibrates at the same frequency as the end of the crankshaft upon which it is mounted, consists of a metal hub to which is vulcanized an annulus of rubber forming a web, and to the latter is vulcanized a sort of flywheel rim or tuning ring of leaded rubber, that is, rubber having a large proportion of litharge incorporated in it, which has a specific gravity of approximately five. Alternately the tuning ring may be made of ordinary rubber and have steel wire screen incorporated in it, to obtain the required mass in compact form. At speeds between the various criticals such a damper does not respond at all. The damper must have the same frequency of natural vibration as the crankshaft assembly for which it is intended. When the crankshaft turns at its critical speed, the damper vibrates torsionally the same as the free end of the crankshaft, but out of phase therewith, with the result that the rubber web is greatly deformed, alternately in opposite directions. Such a damper is effective for one particular critical speed only. Its effect is to damp out vibration due to the particular harmonic almost entirely, so that the particular critical speed vanishes. Two other critical speeds are produced, one higher and the other lower than the original one, but the amplitudes of these are much smaller than that of the original critical, as shown in Fig. 1.

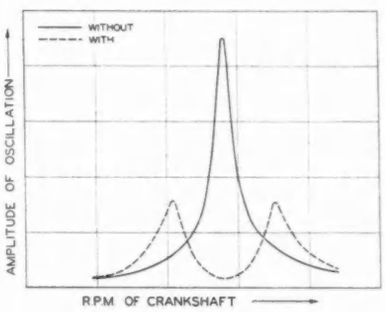


Fig. 1—Critical speeds with and without dynamic damper.

The new calibrating or tuning apparatus consists of a frame with bearings supporting a shaft on which the dynamic damper is mounted. The shaft and damper are not rotated but merely oscillated around their axis through a small angle by means of a mechanism comprising an electric motor, a double step-up by belt and pulleys, an eccentric, and an arm secured to the shaft or to the hub of the damper.

Two white lines are drawn on the tuning ring, parallel with the axis of the damper, and when the speed of oscillation approaches the critical speed of the damper, these white lines will broaden visibly.

In Fig. 2 are given a number of curves obtained in tests of dampers on this testing apparatus. Three of the curves show the variation of the curent consumption of the motor with speed, one without the damper being oscillated, a second with a dynamic damper of the type described, and the third with a Junkers frictional damper. The fourth curve shows the amplitudes of the tuning ring of the dynamic damper.—*ATZ*, August 10.

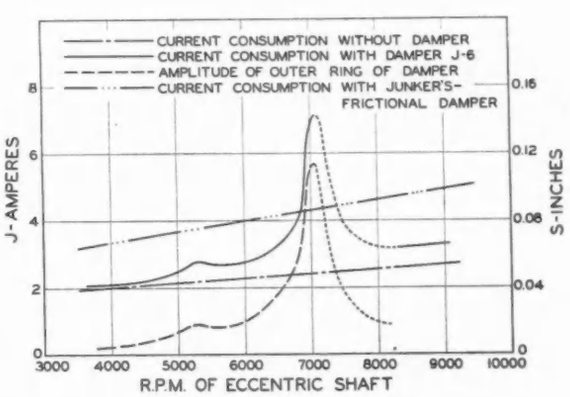


Fig. 2—Current consumption of the timing apparatus and amplitude of the damper as functions of the frequency of the exciting force.

American Tractors

Wheel Type

TRACTOR MAKE AND MODEL	Wheelbase (In.)	OVERALL DIMENSIONS (In.) Length	Width	Height	Net Weight (Lb.)	Minimum Turning Radius (Ft.)	Ground Clearance (In.)	Hp. Rating Belt	Drawbar	Power Take-off	No. of Forward Speeds	PLOWING SPEED—M.P.H. First	Second	Third	Fourth	Reverse	WHEELS Steel Diam. and Face Front (In.)	Rear (In.)	Tire Size Front (In.)	Rear (In.)	ENGINE No. of Cylinders Bore and Stroke (In.)	Valve Arrangement	R.P.M. at Normal Operating Speeds	Maximum Brake Hp. at Specified R.P.M.	Maximum Torque (Lb.-Ft.) at Specified R.P.M.	Displacement (Cu. In.)	Fuel Recommended	Ignition Make	Carburetor Make	Oiling System Type	CLUTCH Make and Type	Type Drive to Traction Members	No. of Drive Wheels	BELT PULLEY Diameter (In.)	Face (In.)	Normal R.P.M.	Steering Type
Allis-Chalmers B	73½	111	53	62	1900	7½	22	18■	15■	Y	3	2.5	4.0	7.8		2.8			4.00/15	8.00/24	4-3¼x3½	I	1400	19-1400	74-1100	116	GD	FM	Zen	DC	Roc-SP	SG	2	8	5½	1054	FK
Allis-Chalmers RC	87½	127	75¼	66¾	2810	8	28¾	21■	17■	Y	4	2.0	3.0	3.9	7.5	1.6	24x4	40x6	4.75/15	10.00/28	4-3⅜x3½	I	1500	22-1500	85-1100	125	GD	FM	Zen	DC	Roc-SP	SG	2	8	5½	1350	SA
Allis-Chalmers WC	87½	128¼	76½	67½	3380▼	8	29½	31■	26■	Y	4	2.6	3.9	5.1	9.7	2.3	24x4	40x6	5.50/16	11.00/28	4-4x4	I	1300	31-1300	128-1200	201	GD	FM	Zen	DC	Roc-SP	SG	2	9	6½	1170	SA
Allis-Chalmers Wf	70	127	57½	60	3400	12	10	31■	26■	Y	4	2.5	3.8	5.0	9.6	2.1	24x4	40x6	5.50/16	11.25/24	4-4x4	I	1300	31-1300	128-1200	201	GD	FM	Zen	DC	Roc-SP	SG	2	9	6½	1170	FK
Allis-Chalmers U	76½	124	36¾	73¾	4620	14½	10	39■	32■	Y	4	2.7	3.5	5.0	11.7	3.1	28x6	45x11½	3.00/16	11.25/28	4-4½x5	I	1200	45-1200	200-900	318	GD	FM	Zen	DC	Roc-SP	SG	2	10	7½	1095	FK
Allis-Chalmers UC	87½	125	33	68	5380	8	30	39■	34■	Y	4	2.5	3.3	4.7	11.0	3.0	24x5	45x11	3.00/16	11.25/28	4-4½x5	I	1200	45-1200	200-900	318	GD	FM	Zen	DC	Roc-SP	SG	2	10	7½	1095	SA
Allis-Chalmers A	90⅝	141	77	75¾	7060	17½	10½	51	41	Y	4	2.5	3.7	5.0	9.7	3.2	32x6	48x12	7.50/18	13.50/28	4-4¾x6½	I	1000	57-1000	345-700	461	G	FM	Zen	DC	Roc-SP	SG	2	13	8½	900	FK
Case R	80⅝	104	55	91½		10				Y	4	2.3	3.3	4.5	10.0		25x4	42x8	5.00/15	9.00/24	4-3¼x4	L	1425			133	GKD		Zen	DC	TD-DO	Cha	2	10⅛	6¼	991	FK
Case RC	79	124	Var	61		7				Y	4	2.3	3.3	4.5	10.0		24¾x3½	48x2½	5.00/15	8.25/36	4-3¼x4	L	1425			133	GKD		Zen	DC	TD-DO	Cha	2	10⅛	6¼	991	SA
Case R1	80⅝	103½	55			10				Y	4	2.3	3.3	4.5	9.2				5.00/15	9.00/24	4-3¼x4	L	1425			133	GKD		Zen	DC	TD-DO	Cha	2	10⅛	6¼	991	FK
Case D	66	120	66			10				Y	4	2.5'	3.5'	4.5'	9.5'		28x5	42x12	6.00/16	11.25/24	4-3⅞x5½	I	1100			260	GKD	Own	Zen	DC	TD-DO	Cha	2	10¼	6¼	973	FK
Case DC	89	136	Var							Y	4	2.5'	3.5'	5.0'	10.0'		25x4	48x2½	5.50/16	9.00/36	4-3⅞x5½	I	1100			260	GKD	Own	Zen	DC	TD-DO	Cha	2	11¾	5¼	846	SA
Case L	79	132	67			13				Y	3	3.3'	4.3'	5.3'			30x6	48x12	7.50/20	12.75/28	4-4⅝x6	I	1100			403	GKD	Own	Zen	DC	TD-DO	Cha	2	13	8½	780	FK
Case **L1	79	118	67			13				Y	3	3.1	4.6	11.8					30x5	40x8	4-4⅝x6	I	1100			403	GKD	Own	Zen	DC	TD-DO	Cha	2	13	8½	780	FK
Eagle 6A	80	130	70	60	4800	7½	12	37	22	Y	3	2.5	3.3	4.5		2.5	30x6	48x12	7.50/18	12.75/28	6-4x4¾	L	1417	57-1400	230-900	358	G	ES	Zen	DC	TD-DP	SG	2	16	8	625	FK
Eagle 6B	82	130	(a)	60	3250	7¾	28	28	18	Y	4	1.8	3.5	5.0	13.0	2.0	24x4	(b)	5.50/16	11.25/24	6-3¼x4½	L	1575	40-1575	136-1000	205	G	ES	Zen	DC	Long-SP	SG	2	8½	7	1180	SA
Eagle 6C	78	124½	60	55	3250	13	18	28	18	Y	4	1.8	3.5	5.0	13.0	2.0	26x6	40x10	6.00/16	11.25/24	6-3¼x4½	L	1575	40-1575	136-1000	205	G	ES	Zen	DC	Long-SP	SG	2	8½	7	1180	FK
Ford 9N	70	115	64	52	2210	15	13	21		Y	3	2.5	3.2	7.5		2.7			4.00/19	8.00/32	4-3⅛x3¾	L	1400	28-2000	86-1000	120	G	Own	MS	DC	Long-SP	BG	2	9	6½	1352	....
General (2) GG	80	118	Var	55		7	23	17	10	Y	3	2.2	3.5	6.0		2.5			5.50/16	9.00/24	4-3x4	L	1400	20-1400	75-1400	113	G	Wi	Til	DC	Long-SP	SG	2	9½	5½	1280	SA
Graham-Bradley 103	90	132	74	60	3500	9	22½	30	25	Y	4	2.8*	4.4*	5.7*	19.8*	2.0*			5.50/16	9.00/36	6-3¼x4⅜	L	1500	38-1500	145-900	217	G	Del	Sch	MF	Long-SP	SG	2	14	7	710	FK
Graham-Bradley 104	90	132	74	55½	3500	14½	18	30	25	Y	4	2.3*	3.7*	4.7*	16.4*	1.7*			3.00/16	11.25/24	6-3¼x4⅜	L	1500	38-1500	145-900	217	G	Del	Sch	MF	Long-SP	SG	2	14	7	710	FK
Huber L	80⅝	123	59	57	4000	12½	15			Y	3	2.4	3.5	4.5		1.8	28x5	42x10	6.00/16	11.25/24	4-4½x5¼	I	1200	46-1200	210-1200	331	GKD	Bos	Zen	DC	TD-SP	SG	2	14	7⅝	705	FK
Huber Super 4	95	160	88	62	9500	14	11½	62	40	Y	2	2.2	3.2			1.7	34x6	56x20	7.50/18	12.75/28	4-5½x6½	I	1000	69-1000	330-825	618	GKD	Bos	Zen	DC	TD-DP	SG	2	15	9⅝	666	FK
Huber B	84½	127½	72½	55	3100	9	26½			Y	4	2.2	3.2	4.3	8.6	1.8	25x4½	50x8	5.50/16	9.00/36	4-3⅞x4½	L	1300	33-1300	132-1300	205	GD	Bos	Zen	DC	Roc-SP	IG	2	10	7	990	SA
Huber HK	83¾	137½	73	61	6000	15	12½			Y	3	2.3	3.0	5.5		1.8	34x6	50x12	7.50/18	12.75/28	4-5½x6¼	I	1150	65-1150	320-900	516	GKD	Bos	Zen	DC	TD-SP	SG	2	17	8½	616	FK
Huber Le	85½	130	82½	57	3900	9½	30			Y	3	2.4	3.5	4.5		1.8	25x4½	42x10	6.00/16	11.25/24	4-4½x5¼	I	1200	46-1200	210-1200	331	GKD	Bos	Zen	DC	TD-SP	SG	2	14	7⅝	705	SA
I.H.C. (1) I-14	60	98¾	53⅞	51½	3525	8½	10			†	3	3.3*	5.7*	9.8*		3.4*			6.00/9	9.00/24	4-3x4	I	2000	22-2000	74-1000	113	G	Own	Own	DC	Roc-SP	SG	2	13½†	6¼†	1068	FK
I.H.C. 20	78	121¾	59½	53	5950	14½	10¼			†	4	2.3*	4.2*	7.1*	10.7*	3.2*			5.50/20	8.00/40	4-4¼x5	I	1000	33-1000	180-750	284	G	Own	Zen	CS	Own-SP	SG	2	15½†	8½†	645	FK
I.H.C. I-30	78	121¾	84⅞	63	7550	15	9½			†	4	2.6*	4.3*	7.8*	13.1*	3.3*			5.50/20	8.00/40 (f)	4-4¼x5	I	1200	45-1200	205-950	284	G	Own	Zen	CS	Own-SP	SG	2	15½†	8½†	750	FK
I.H.C. I-40	85	139	95⅛	72	8725	17	10			†	4	2.0*	3.7*	7.0*	11.2*	3.0*			7.50/20	12.75/28(f)	6-3⅜x4½	I	1750	58-1750	195-800	298	GD	Own	Zen	DC	Own-SP	SG	2	16¾†	9†	645	FK
I.H.C. Diesel ID-40	85	139	95⅛	72	9620	17	10			†	4	2.3*	4.3*	7.7*	11.3*	3.5*			7.50/20	12.75/28(f)	4-4¾x6½	I	1200	58-1200	296-550	461	O	N	N	DC	Own-SP	SG	2	16¾†	9†	642	FK
I.H.C.-Farmall A	70	104¾	55⅞	63	1800	9	21	16■	13■	†	4	2.2	3.5	4.6	9.6	2.6			4.00/15	8.00/24	4-3x4	I	1400			113	GKD	Own	Zen	DC	Roc-SP	SG	2	8½†	6†	1157	FK
I.H.C.-Farmall B	72½	107¼	81⅛	63	1750	7½	21	16■	13■	†	4	2.2	3.5	4.6	9.6	2.6			6.00/12	8.00/24	4-3x4	I	1400			113	GKD	Own	Zen	DC	Roc-SP	SG	2	8½†	6†	1157	SA
I.H.C.-Farmall H	90	126¾	75½	74	3000(c)	8½	23¼	24■	19■	†	5	2.4	3.2	3.9	4.9	2.8	22½x3¼	51x6	5.50/16	9.00/38	4-3⅜x4¼	I	1650			152	GKD	Own	Own	DC	Roc-SP	SG	2	9¾†	7½†	1019	SA
I.H.C.-Farmall M	90	126¾	84½	75½	3925(c)	8½	23¼	33■	26■	†	5	2.4	3.2	3.9	4.7	2.9	22½x4	51x8	8.00/16	10.00/38	4-3⅞x5¼	I	1450			247	GKD	Own	Own	DC	Roc-SP	SG	2	11†	7½†	898	SA
I.H.C.-McC.-D O-14	60	120	52	50⅝	3450	9½	9			Y	3	3.6*	6.1*	10.6*		3.6*			6.00/16	11.25/24	4-3x4	I	2000			113	GD	Own	Own	DC	Roc-SP	SG	2	13½†	6¼†	1066	FK
I.H.C.-McC.-D W-14	60	103	50	50½	2900	9		16	10	Y	3	2.1	2.7	3.5		2.1	22½x3½	42x8	5.00/16	11.25/24	4-3x4	I				113	GD	Own	Own	DC	Roc-SP	SG	2	13½†	6¼†	764	FK
I.H.C.-McC.-D 10-20	78	123	50	70	4265	15	10½	22	14	†	3	2.2	3.0	4.2		2.6	30x4½	42x12	8.00/20	11.25/28	4-4¼x5	I				284	GKD	Own	Own	CS	Own-SP	SG	2	15¼	7	645	FK
I.H.C.-McC.-D†† W-30	72½	121¾	66¼	63	4900	13½	9⅞	33	21	†	4	2.2	2.7	3.3	4.1	2.3	30x4½	42x12	6.00/20	12.75/28	4-4¼x5	I	1200			284	GD	Own	Zen	CS	Own-SP	SG	2	14⅝	8½	704	FK
I.H.C.-McC.-D†† W-40	85	141¼	66¾	71	6630	17	10⅜	45	28	†	4	2.2	2.7	3.7	4.3	2.7	34x6	50x12	7.50/20	12.75/32	6-3¾x4½	I	1750			298	GD	Own	Zen	DC	Own-SP	SG	2	15¼	9	645	FK
I.H.C.-McC.-D†† WD-40	85	141¼	66¾	71	7550	17	10⅜	48	30	†	4	2.3	3.0	4.0	4.6	3.0	34x6	50x12	7.50/20	12.75/32	4-4¾x6½	I	1200			461	O	N	N	DC	Own-SP	SG	2	16¾	9	642	FK
John Deere A	90	128⅞	83	61⅝	3817	8½	10½	NR	NR	Y	4	2.3	3.0	4.0	5.2	3.7	24x4	50x6	5.50/16	9.00/38	2-5½x6¾	I	975			321	D	Wi	MS	DC	Own-DP	SG	2	12¾	7⅜	975	FK
John Deere B	85	125½	83½	57	2878	7½	10½	NR	NR	Y	4	2.3	3.0	4.0	5.2	3.7	22x3¼	48x5½	5.00/15	8.00/38	2-4½x5½	I	1150			175	D	Wi	MS	DC	Own-DO	SG	2	10⅝	6	1150	FK
John Deere G	90¼	135	84	61¼	4400	8½	11½	NR	NR	Y	4	2.2	3.2	4.2	6.0	3.0	24x5	51½x7	6.00/16	10.00/36	2-6½x7	I	975			413	D	ES	MS	DC	Own-MD	SG	2	12¾	8½	975	FK
John Deere H	76	111¼	79	52	2063	7½	11½	NR	NR	†	3	2.5	3.5	5.7		1.7			4.00/15	7.00/32	2-3⅝x5	I	1400			100	D	Wi	MS	DC	Own-SP	SG	2	12¼	4½	700	FK
John Deere D	70	130	66½	59¼	5152	13½	10	NR	NR	Y	3	2.2	3.2	4.0		1.5	28x6	48x12	7.50/18	12.75/28	2-6⅝x7	I	900			501	D	ES	MS	DC	Own-MD	Cha	2	13¼	8½	900	FK
M-M Twin City (3) RTU	76	112	81¼	62	2720	7½	20¼	18	14	Y	4	2.3	3.3	4.2	12.0	2.6			4.00/15	8.00/36	4-3⅝x4	I	1400	24-1400	100-1100	165	G	FM	Sch	DC	TD-SP	BG	2	12¼	6	933	SA
M-M Twin City RTN		112	81¼	62	2700	7½	20¼	18	14	Y	4	2.3	3.3	4.2	12.0	2.6			3.00/12	8.00/36	4-3⅝x4	I	1400	24-1400	100-1100	165	G	FM	Sch	DC	TD-SP	BG	2	12¼	6	933	FK
M-M Twin City RTS	69	108	81¼	62	2800	8	12	18	14	Y	4	2.3	3.3	4.2	12.0	2.6			4.00/15	8.00/36	4-3⅝x4	I	1400	24-1400	100-1100	165	G	FM	Sch	DC	TD-SP	BG	2	12¼	6	933	FK
M-M Twin City ZTU	82	127	79	72	3620	8	24	27	21	Y	5	2.3	2.8	3.9	4.9	1.2	25x4½	50x8	5.50/16	9.00/36	4-3⅝x4½	I	1500	33-1500	122-1100	186	G	FM	Sch	DC	TD-DP	SG	2	14	7	786	SA
M-M Twin City ZTS	72½	122	60	69	3675	9	9	27	21	Y	5	2.3	2.8	3.9	4.9	1.2	25x4½	50x8	5.50/16	9.00/36	4-3⅝x4½	I	1500	33-1500	122-1100	186	G	FM	Sch	DC	TD-SP	SG	2	14	7	786	FK
M-M Twin City ZTN		127	79	72	3600	8	24	27	21	Y	5	2.3	2.8	3.9	4.9	1.2			7.50/10	9.00/36	4-3⅝x4½	I	1500	33-1500	122-1100	186	G	FM	Sch	DC	TD-SP	SG	2	14	7	786	SA
M-M Twin City UTS	80½	135	74½		5200	12	14	38	31	Y	5	2.7	3.4	4.7	6.2	1.3	28x5	50x10	7.50/16	12.75/32	4-4¼x5	I	1275	47-1275	190-1000	284	G	FM	Sch	DC	TD-SP	SG	2	15½	7	733	FK
M-M Twin City UTU	88	139½	84½	69½	5200	8½	22½	38	28	Y	5	2.5	3.2	4.3	5.7	1.2	28x5	50x10	6.00/16	11.00/36	4-4¼x5	I	1275	47-1275	190-1000	284	G	FM	Sch	DC	TD-SP	SG	2	15½	7	733	SA
M-M Twin City UDLX	81	141	77	94	6250	17	14	38	31	Y	5	2.7	3.4	4.7	10.1	1.3			7.50/16	12.75/32	4-4¼x5	I	1275	47-1275	190-1000	284	G	Del	Sch	DC	TD-SP	SG	2	15½	7	733	FK
M-M Twin City GT		136½	72	76	6220	13⅜	10	49	36	Y	4	2.7	3.8	4.8	9.6	2.6	34x5⅜	50x12	7.50/18	12.75/32	4-4⅝x6	I	1075	59-1075	295-950	403	G	FM	Sch	DC	TD-SP	SG	2	16	7½	650	FK
Oliver Row Crop 70-HC-KD	91¼	137½	80½	59⅝	3200	8	17¼	25■	17■	†	4	2.4	3.3	4.3	5.9	2.4	24x4½	55x32	5.50/16	9.00/40°	6-3½x4⅜	I	1500	■28-1500	105-1200	201	GKD	Bos	Zen	DC	BB-SP	SG	2	12¾†	7¼†	774	SA
Oliver Std. & Orch. 70-HC-KD	72	135⅝	61½	52⅛	3100	11½	11⅜	25■	16■	†	4	2.4	3.3	4.3	5.9	2.4	27x4½	42x10	5.50/16°	9.00/24°	6-3½x4⅜	I	1500	■28-1500	105-1200	201	GKD	Bos	Zen	DC	BB-SP	SG	2	12¾	7¼	774	FK
Oliver Row Crop 80-HC	93⅛	144	80	64½	4545	8½	17½	35	23	†	4	2.5	3.3	4.3	5.8	3.0	24x4½	59½x⅝	6.00/16	11.25/40	4-4¼x5¼	I	1200	38-1200	180-900	298	G	Bos	Sch	DC	BB-SP	SG	2	14½	7¼	731	SA
Oliver Row Crop 80-KD	93⅛	144	80	64½	4545	8½	17½	35	23	†	4	2.5	3.3	4.3	5.8	3.0	24x4½	59½x⅝	6.00/16	11.25/40	4-4¼x5¼	I	1200	38-1200	180-900	334	KD	Bos	Sch	DC	BB-SP	SG	2	14½	7¼	731	SA

| | | |

Building Integral Body and Chassis

(*Continued from page* 279)

Other detail developments include the use of safety glass for all the windows of buses (although the law demands it for the forward-facing windows only); the adoption of molded rubber front fenders as standard equipment by several makers, and the provision of a sliding roof on double-deck bodies for city services as well as for single-deckers for use in urban and rural areas. In a few cases the curved panels at each side of the sliding roof are of safety glass.

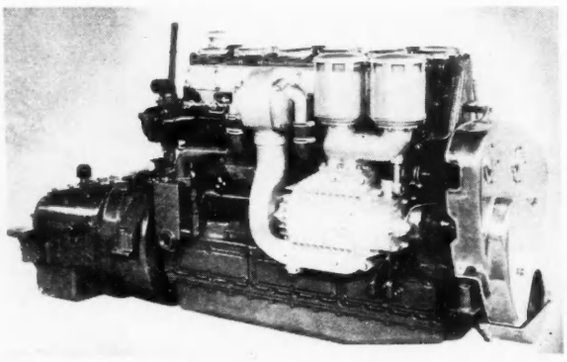
The first British bus with a supercharged Diesel engine has recently been put into service experimentally. It has a standard type A.E.C. chassis and double-deck body. The engine is a Six of 538 cu. in. displacement, normally developing 130 hp. With a Centric supercharger giving a boost pressure of about 5 lb. per sq. in., the output is raised to 175 hp. The object of supercharging in this case is to gain the additional power for operating on hilly routes, with gradients as steep as 17 per cent and long grades of from 6 to 13 per cent. Besides giving better acceleration after a stop on up-grades, supercharging gives the impression of making the Diesel engine appreciably quieter in running, critical observers have stated.

Since the outbreak of war, unprecedented interest has been taken by bus operators in substitutes for gasoline and fuel oil, owing to these being rationed for all types of motor vehicles. Coal gas secured first attention, but the difficulty of obtaining steel cylinders for high-pressure storage has discouraged attempts to use this kind of fuel, though there are a fair number of buses equipped for it in provincial centers, notably Birmingham.

Gas-producer plants then came into the picture; a few London and provincial buses have been fitted with producer plant, carried either on a trailer or on a rear extension of the chassis. But there has been no rush to convert buses generally to producer gas, though many different types of plant are available; more have been fitted to trucks than buses, but even these are found on only a very small proportion of vehicles in use. Operators are reluctant to lay down the capital involved owing to a belief—not universal, admittedly—that producer gas, so far as England is concerned and despite the fuel economy it affords, is not likely to survive as anything more than the emergency fuel for war-time use.

Roots - Blower Type Commercial Superchargers

SCHWITZER-CUMMINS COMPANY, whose work in the supercharger line is best known through the centrifugal supercharged supplied by them to a number of car makers for the equipment of passenger cars, are now also producing superchargers or blowers of the Roots type, which is better adapted than the centrifugal type to use on Diesel engines. In fact, we understand that at the present time the company's supercharger business is largely confined to applications to Diesel engines. Two-stroke Diesel engines practically require a blower for scavenging, and recently there has been considerable interest also in supercharging of four-stroke engines. It has been the experience of the Schwitzer-Cummins Company that it is a relatively simple matter to increase the output of a Diesel engine 25 per cent by supercharging. This involves no operating difficulties of any kind, we are informed, and peak temperatures of piston heads and other parts of the combustion-chamber wall often can be kept lower than without supercharging, for the reason that some of the air is blown through the engine for internal cooling. In some cases the power has been increased 50 per cent without sacrifice in reliability of the engine, though it will be realized that the gains which can be made are dependent not only on the blower but also on the engine.



Schwitzer-Cummins supercharged Diesel

The accompanying photograph shows a Schwitzer-Cummins Roots-type blower fitted to a Cummins Diesel engine. The housing of the blower is made of aluminum-alloy castings with integral cooling fins, and the construction is the familiar one with lobed rotors on parallel shafts which are geared together at one end. Air is admitted to the blower from the air cleaners on top, and passes out through a pipe leading to the inlet manifold.

It appears that the first Roots-type blowers built by Schwitzer-Cummins were for racing engines—automobile and marine—and that their application to stock engines came with the development of the high-speed Diesel engine.

NEWS OF THE INDUSTRY

Graham Plans Early Production (Story on page 300)

Ford Wins in Chain Tax Case

District Court Exempts Dealers

In preliminary announcement of his findings in the Ford Motor Company's chain store tax appeal, District Judge Henry A. Hicks gave a ruling that the Colorado dealers, associate and subdealers are not liable under the state chain store tax law.

The decision grew out of an attempt by the state treasurer, C. M. Armstrong, to collect taxes from Ford and other automobile manufacturers, claiming that the car dealers really constituted a chain under control of the manufacturer. Armstrong has given notice of appeal to the State Supreme Court.

In his decision Judge Hicks said, "There is no intent in the statute to include manufacturers and their dealers . . . A decided preponderance of the evidence establishes the fact that Ford dealers in Colorado are, in the highest degree, independent; that they put whatever price they choose on used cars; that they keep their books and follow accounting systems as they please; that they run their establishments as they see fit and proper in accordance with the judgment of each individual dealer as to what is best for his business.

"The evidence also establishes that only about half of them live up to their sales quota, a few go above and many below it; that they handle local advertising in any manner they see fit; that they pay for it and prescribe its form and contents.

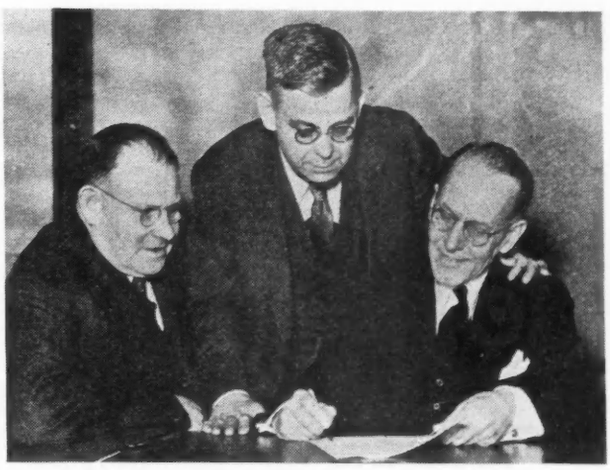
"It is further clear from the evidence that practically all of them handle large amounts of competing products, and that many of them engage in enterprises of a similar as well as of a different nature, and that a substantial portion of their income comes from businesses and products other than those manufactured by the plaintiff."

Harvester Reports $12,980,000 Profit

Net income of International Harvester Co. for its fiscal year ended Oct. 31, 1939, was reported by the company as $12,980,000. This was compared with a net income of $18,472,000 for the 1938 period. The company's sales in foreign countries declined 7.5 per cent from 1938. Domestic sales declined 6.4 per cent.

Planners

New management of the reorganized Graham-Paige Motors Corp. confers over early manufacturing schedules. Left to right are August Johnson, executive vice-president; W. L. Eaton, secretary-treasurer; and Joseph B. Graham, president. See news story on page 300.



Dealer Referendum to Determine NADA Position on Patman Bill

Ballots Mailed to All Dealers Must Be Returned by March 30

The National Automobile Dealers Association has mailed a referendum pamphlet and ballot to all automobile dealers to obtain a free expression from the dealers of their approval or disapproval of the Patman Bill, otherwise known as the Motor Vehicles Industry Act of 1940. This bill was presented by the legislative committee of NADA to the annual convention held in Washington in January.

In accordance with a resolution passed at the convention the opponents and proponents of the bill prepared statements which are included in the pamphlet. Ballot returns must be made by the end of this month.

The briefs included in the pamphlet are as follows:

Brief Against the Bill

1. FEDERAL CO-ORDINATOR. The men to whom the proposed Bill would assign your affairs are *Politicians*. Otherwise they would not be in a position to accept the responsibility. Think of those politicians *you* know as managing *your* business.

2. INTERSTATE COMMERCE. Proposed Bill brings automobile dealers closer into interstate commerce [Section 2, (a) and (c)] with all the involvement of the National Labor Relations Board and the Wage and Hour Act ready to come in.

3. CONTRACTS ALREADY IMPROVED. N.A.D.A. has made remarkable progress negotiating with manufacturers even with a committee more than half legislation-minded—proof—

a. Check your 1940 contract with that of even five years ago.

b. San Francisco resolution was not fulfilled. Rather than an equitable contract, twenty-two *Points* or *Suggested Provisions* were discussed with only *TWO MANUFACTURERS*, but mailed to all manufacturers and AMA, although several additional manufacturers invited such conferences.

c. Such 1940 contracts as have been presented to dealers so far show marked improvement.

4. USED CARS. Used cars account for your losses. Proposed legislation does not deal with this problem.

5. NO TERRITORY PROTECTION. Territory protection wanted by most dealers was removed from the Bill at the insistence of governmental advisors in the interests of the public.

6. THE REAL DANGER. Section 11 of this Bill reads as follows: "The Commission is authorized to prescribe such rules and regulations as it deems necessary to carry out the provisions of this Act."

7. BUREAUCRACY. This Bill *suggests* that Congress sign a blank check to a Commission—giving it authority to make *Rules* having the full force of *LAW*. An Act that will foster and propagate a generation of pirates, gyps

(*Turn to page* 300, *please*)

Workers in GM Plants Will Choose Bargaining Affiliation

Secret Ballots in 59 Plants to Comply with Recent NLRB Order

To Regional Director Frank H. Brown, Detroit, has been left the fixing of the exact date of elections "as soon as practicable" ordered by the National Labor Relations Board among the 125,000 to 150,000 employes of 59 General Motors plants in 12 states. This will be the largest number of workers ever to cast ballots at one time. The election is based upon an agreement entered into Feb. 13 between the corporation, AFL and CIO unions. The stipulation provides that elections will be held among three classifications of workers, pattern makers, die sinkers and production and maintenance employes. Although no definite date was established as this was written, it was expected that the voting would be done about the middle of next month with April 15 mentioned as the possible date.

Pattern makers in 10 separate plants will vote whether they desire to be represented by the AFL's Pattern Makers League, the CIO-UAW or neither. The die sinkers at the Buick motor division plant at Flint, Mich., and at the Chevrolet motor division forge plant at Detroit will vote whether they desire to be represented by AFL's International Association of Machinists' Lodge 1411 or Lodge 1217, respectively, by CIO-UAW or by neither. Production and maintenance employes in 58 plants, which include nine of the foregoing 10, will vote in secret plant-wide elections whether they desire to be represented by CIO-UAW, by AFL-UAW or by neither.

If a majority of the pattern makers in any plant chooses the Pattern Makers League they shall constitute a separate bargaining unit; if a majority of these pattern makers in any plant chooses the CIO-UAW, they shall become part of the larger plant unit if the employes in this larger unit choose the CIO-UAW.

Likewise, if a majority of the die sinkers chooses the International Association of Machinists, they shall constitute a separate bargaining unit; if a majority of these die sinkers in any plant chooses the CIO-UAW, they shall become part of the larger plant unit if the employes in this larger unit choose the CIO-UAW.

All production and maintenance employes in each individual plant in which a majority chooses the AFL-UAW shall constitute a single unit appropriate for the purposes of collective bargaining. Likewise, all these employes at each indivdual plant in which a majority chooses the CIO-UAW shall constitute a single unit appropriate for the purposes of collective bargaining.

The 10 plants in which votes will be taken among the pattern makers and

(*Turn to page* 302, *please*)

Passenger Car and Truck Production

(U. S. and Canada)

	January 1940	December 1939	January 1939	Per Cent Change Jan. 1940 Over 1939
Passenger Cars—U. S. and Canada				
Domestic Market—U. S.	348,755	357,712	262,330	+ 33.0
Foreign Market—U. S.	13,981	16,092	19,135	− 27.0
Canada	12,579	11,491	11,404	+ 14.9
Total	375,315	385,295	292,869	+ 28.0
Trucks—U. S. and Canada				
Domestic Market—U. S.	55,046	60,650	47,391	+ 16.2
Foreign Market—U. S.	14,319	17,688	13,312	+ 7.8
Canada	4,634	5,487	3,390	+ 36.6
Total	73,999	83,825	64,093	+ 15.6
Total—Domestic Market—U. S.	403,801	418,362	309,721	+ 30.2
Total—Foreign Market—U. S.	28,300	33,780	32,447	− 12.8
Total—Canada	17,213	16,978	14,794	+ 16.2
Total—Cars and Trucks—U. S. and Canada	449,314	469,120	356,962	+ 26.0

Monthly Motor Vehicle Production

(U. S. and Canada)

	PASSENGER CARS		TRUCKS		TOTAL MOTOR VEHICLES	
	1940	1939	1940	1939	1940	1939
January	375,315	292,869	73,999	64,093	449,314	356,962
February		253,914		63,606		317,520
March		312,392		77,103		389,495
April		286,200		68,066		354,266
May		249,455		63,793		313,248
June		257,289		66,964		324,253
July		155,850		62,644		218,494
August		62,475		40,868		103,343
September		165,119		27,559		192,678
October		259,610		65,078		324,688
November		295,134		73,407		368,541
December		385,295		83,825		469,120
Total		2,975,602		757,006		3,732,608

Otto Lundell

Otto Lundell, who until his retirement a year ago from active business was president of Michigan Tool Co., Colonial Broach Co. and Detroit Tap and Tool Co., died at Fort Lauderdale, Florida, recently, at the age of 60.

Michigan Tool Company was organized in 1915 by Mr. Lundell and his associates with Mr. Lundell as vice-president of the concern until 1935, when he became president. In 1918 he organized Colonial Broach Company and was president of this company until his retirement. Detroit Tap and Tool Company was also organized by Mr. Lundell.

Notable in Mr. Lundell's career was the development of the now widely adopted Michigan Tool method of finishing gears for automotive transmissions which was completed at Michigan Tool Co. during his active management of the concern.

Studebaker Reports $2,923,251 Profit

Studebaker Corp. has reported a consolidated net profit of $2,923,251 for the year 1939. For 1938, the company reported a net loss of $1,762,465. Net sales of $81,719,106 for 1939 were an increase of 87 per cent over the 1938 total. Unit sales in 1939 were 117 per cent greater than in 1938, totaling 114,196 passenger cars and trucks against 52,605 the preceding year.

40 YEARS AGO

J. W. Cregar, New York agent of the Pratt & Whitney Co., is interested in a new anti-friction bearing resembling the graphite bearing in principle. It is made by taking a bushing, boring it full of holes, plugging the holes with a hard wood imported from South America and treated with a secret chemical process and then bringing the end of the grain of wood to bear on the revolving shaft. Successful tests are said to have been made on high speed machinery, and the patentees are introducing it to the motor vehicle trade.

From *The Horseless Age*, March, 1900.

Russia's KIM Plant Reported Under Way

A report to the Department of Commerce from Russia, dated November, indicates that the plan for the new KIM automobile plant has been accepted by the authorities. Capacity, the report stated will be 50,000 cars a year at the rate of 178 daily.

In addition to the main assembly building, the plan was said to call for seven shops and five accesory buildings, containing in all 2400 units of high-production machinery. Some of this was expected to be produced in Soviet plants.

The report stated that erection of the plant was expected to be completed before the end of 1940, but that production would be begun before that time and will reach 15,000 cars. These plans depend on the plant erection which, it is said, is proceeding very slowly.

The proposed car will hold four passengers and will be powered with an engine developing 30 hp. at 4200 r.p.m.

Selwyn F. Edge

Selwyn Francis Edge, one of the most colorful characters among the pioneers of the British automobile industry, died recently at Eastbourne, England. Edge was born in Sydney, Australia, in 1868, and was taken to England by his parents when three years old. He was educated for an army career but entered the bicycle industry in his youth and later became associated with the Dunlop Rubber Co. In 1898 he bought an early Panhard car and with its aid he induced the late Montague Napier to launch upon the manufacture of automobiles. Edge was sales manager for the Napier firm, which pioneered the six-cylinder car, from 1903 to 1912. He took active part in races and endurance contests and was a frequent contributor to the correspondence columns of the British automobile papers. After his retirement from active connection with the automobile industry he followed agricultural pursuits in Sussex.

In 1902 he won the Gordon Bennett international race in France and as a result the race was run in Ireland the following year. Shortly after the opening of Brooklands track he established a 24-hour record which stood for a long time.

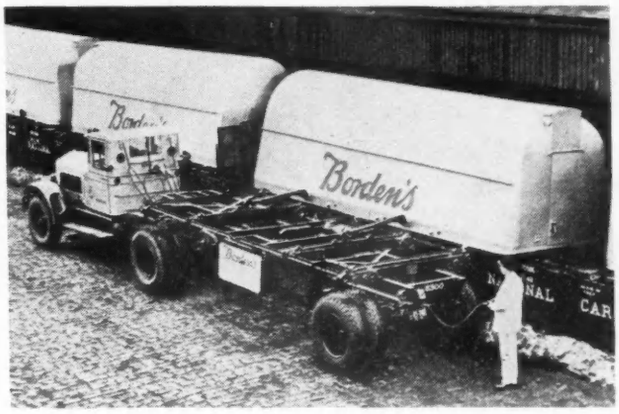
Leaving the Napier firm in 1912 he turned to farming, and during the world war he was controller of the agricultural machinery department of the Ministry of Munitions. After the war he joined A. C. (Acedes) Cars, Ltd., from which he resigned a few years ago.

Goodyear Profit

Goodyear Tire & Rubber Co. report to stockholders for the year ended Dec. 31, 1939 indicated a net profit of $9,838,797. Net sales for the same period amounted to $200,101,704.

Rail-Truck

Some of the new demountable Borden's Farm Products Co. milk tanks for handling a portion of the company's incoming bulk milk supply to New York City by a newly-developed system of rail-truck coordination. The tanks are transferred mechanically from flat cars to trucks, or vice versa, by push-button control.



Acme

Australia Suspends Production Contract

Official announcement has been made in Australia that the government's contract with Australian Consolidated Industries, Ltd., for the manufacture of motor vehicle engines would be suspended until Parliament reassembles in April, says a report received from Trade Commissioner Wilson C. Flake, Sydney. Under the government program to encourage local production of automobiles and trucks, this company was to be granted a monopoly of engine manufacture. The present government move to suspend this grant developed because of widespread opposition in the Commonwealth against granting monopoly rights to one company.

Caterpillar Reports Profit of $6,004,890

The annual report of Caterpillar Tractor Co. indicated a net profit of $6,004,890.37 for the year ended Dec. 31, 1939. In 1938 net profit for the year was reported as $3,235,710. Dollar volume of sales for 1939 was given as $58,432,921.32. This compared with $48,246,140 in 1938.

Automotive Exports and Imports for Six Months

	JANUARY 1940		JANUARY 1939		SIX MONTHS ENDED DECEMBER 1940		SIX MONTHS ENDED DECEMBER 1939	
	No.	Value	No.	Value	No.	Value	No.	Value
EXPORTS								
Automobiles, parts and accessories		$ 23,735,894		$ 21,396,210		$ 109,465,750		$ 115,820,517
PASSENGER CARS								
Passenger cars and chassis	13,334	7,812,328	14,976	8,911,080	48,130	29,472,602	69,199	42,258,883
Low price range $850 inclusive	11,915	6,370,614	13,341	7,183,946	42,527	23,533,891	60,808	33,377,261
Medium price range over $850 to $1200	1,261	1,193,999	1,408	1,351,892	4,552	4,330,661	7,191	6,794,788
$1200 to $2000	143	207,270	187	279,561	928	1,292,622	939	1,396,289
Over $2000	15	40,445	40	95,681	123	315,428	261	690,525
COMMERCIAL VEHICLES								
Motor trucks, buses and chassis (total)	9,538	6,211,018	8,816	5,024,297	50,080	29,779,663	49,629	30,025,555
Under one ton	1,555	646,446	1,186	490,037	7,252	2,959,977	7,033	2,838,090
One and up to 1½ tons	6,697	3,495,936	6,704	3,415,852	36,016	18,476,983	35,539	18,669,824
Over 1½ tons to 2½ tons	972	1,192,510	632	571,376	4,970	4,635,452	4,441	3,508,073
Over 2½ tons	311	873,191	263	517,672	1,664	3,508,176	2,334	4,524,582
Bus chassis	3	2,935	31	29,350	178	199,075	282	484,986
PARTS, ETC.								
Parts except engines and tires		5,132,679		3,508,400		22,035,185		18,960,746
Automobile unit assemblies		3,180,913		2,813,839		19,943,530		18,019,957
Automobile parts for replacement (n.e.s.)		349,139		300,855		2,348,311		2,097,710
Other automobile accessories (n.e.s.)		284,145		464,836		2,418,423		2,577,853
Automobile service appliances	746	15,946,409	1,052	2,545,922	6,086	40,754,811	8,210	16,521,650
Airplanes, seaplanes and other aircraft	206	25,480,817	72	4,892,218	703	68,076,859	411	31,014,365
Parts of airplanes, except engines and tires								
INTERNAL COMBUSTION ENGINES Stationary and Portable								
Diesel and semi-Diesel	71	188,862	16	77,881	401	1,480,093	256	844,281
Other stationary and portable								
Not over 10 hp.	1,189	67,807	498	33,967	9,435	509,716	10,176	475,972
Over 10 hp.	299	170,717	71	75,778	1,593	924,503	1,102	664,554
Engines for:								
Motor trucks and buses	2,452	291,762	2,177	248,665	14,424	1,741,982	9,193	1,015,408
Passenger cars	2,681	223,015	1,665	139,726	11,602	1,023,422	12,296	1,003,900
Aircraft	364	3,314,150	94	587,946	1,053	8,344,864	697	4,554,455
Accessories and parts (carburetors)		283,162		186,666		1,570,496		1,325,339
IMPORTS								
Automobiles (dutiable)	56	68,869	45	36,547	383	336,877	254	186,005

Business in Brief

***Written by the Guaranty Trust Co., New York, Exclusively for* AUTOMOTIVE INDUSTRIES**

Relatively steady general business activity is indicated. The New York *Times* seasonally adjusted index for the week ended Feb. 24, at 96.1 per cent of the estimated normal, registered a decline of only half a point, the smallest recession so far this year, as against a drop of two points in the preceding week, and stands 7.9 points above the comparable 1939 level. *The Journal of Commerce* unadjusted index also recorded a half-point decline, to 95.3 per cent of the 1927-29 average.

Retail trade improved moderately last week, with sales totals ranging, according to Dun & Bradstreet estimates, from three to nine per cent above the levels indicated a year ago. Department store sales during the week ended Feb. 24 were five per cent greater than the corresponding 1939 total, according to the Federal Reserve compilation, as compared with a similar excess of two per cent reported for the week before.

Production of electricity by the power and light industry declined further in each week of the fortnight ended Feb. 24 but was 10.2 per cent greater than the comparable output last year.

Railway freight movement during the same period again dropped substantially. Car loadings in the week ended Feb. 24 numbered 595,032, as compared with 607,924 during the preceding week and 657,004 in the fifth week of the year, but were seven per cent more than the corresponding 1939 total.

Bank debits to individual accounts in leading cities during the week ended Feb. 21 were 20 per cent above the total for the week before, which included five business days, and 28 per cent above the comparable amount last year.

Crude oil production during the week ended Feb. 24 averaged 3,732,100 barrels daily, as compared with 3,717,950 barrels in the preceding week, and was 23,100 barrels in excess of the required output as computed by the Bureau of Mines.

Average daily production of bituminous coal during the same period was 1,650,000 tons, as compared with 1,517,000 tons for the week before and 1,453,000 tons a year ago.

Business failures during the week ended Feb. 22 numbered 225, according to the Dun & Bradstreet report, as against 292 in the preceding week and 267 in the corresponding period last year.

Cotton-mill activity declined in the week ended Feb. 24, contrary to the usual seasonal trend. The New York *Times* adjusted index dropped to 121.7 from 138.4 for the week before, as compared with 120.0 a year ago.

Professor Fisher's index of wholesale commodity prices shows further relative stability, standing for the week ended March 1 at 84.4 per cent of the 1926 average, as compared with 84.3 a fortnight earlier and 84.7 four weeks ago.

Excess reserves of the member banks of the Federal Reserve system rose $60,000,000 during the week ended Feb. 28 to an estimated new peak of $5,690,000,000. Business loans of the reporting members a week earlier totaled $4,316,000,000, or $550,000,000 more than the corresponding amount last year.

Employes Benefit in GM Separation Plan

Alfred P. Sloan, Jr., chairman of General Motors, has announced today a separation allowance plan for salaried employes of the corporation and its wholly owned subsidiaries in the United States. The plan provides that any salaried employe with one year or more of continuous service who is released for reasons beyond his control will be paid a separation allowance. This will amount to 25 per cent of one month's pay for each year's service up to 10 years. For each year's service in excess of 10 years the allowance will be on the basis of 35 per cent of one month's pay. The minimum separation allowance is one-half of one month's pay and the maximum is six months' pay. Employes who are rehired will, by repaying their separation allowance, reestablish their service credits with the corporation.

The plan provides that any released or laid-off salaried employe who has a complaint regarding his separation and who has exhausted all steps for adjusting the complaint within the division from which he was separated may appeal the case to an official of the corporation. In this respect the procedure is somewhat similar to the plan established in 1938 which set up the General Motors Dealer Relations Board to review complaints by dealers.

Truck Production by Capacities

(U. S. and Canada)

	JANUARY			Per Cent of Total	
	1940	1939	Per Cent Change	1940	1939
1½ Tons and less	65,918	59,619	+ 10.4	89.08	93.04
2 to 3 Tons	5,113	2,609	+ 96.0	6.91	4.07
3½ Tons and over	1,015	881	+ 15.0	1.37	1.37
Special and buses	1,953	972	+101.0	2.64	1.52
Total	73,999	64,081	+ 15.6	100.00	100.00

MEN . . . . . .

E. S. Marks has resigned as vice-president in charge of production for Aircooled Motors Corp. and has accepted a position as quality engineer for Pratt & Whitney Aircraft. For many years Mr. Marks was chief engineer of the Franklin Automobile Co.

G. A. Smith, assistant plant manager of the Meriden, Conn., factory of the New Departure division, General Motors Corp., has been appointed assistant general manager of the Hydra-Matic Transmission division in Detroit.

W. E. Imhoff has been appointed sales manager of the replacement parts division of McCord Radiator & Mfg. Co. For the past two years he has been district representative in Detroit.

P. A. Abe, works manager of Monarch Machine Tool Co., has been elected vice-president in charge of engineering and production. **J. A. Raterman,** purchasing agent, has been elected vice-president in charge of purchasing and plant engineering.

G. E. Law, formerly in the application engineering department of Reliance Electric & Engineering Co., has been transferred to the company's Chicago office as a sales engineer. **J. W. Eakins,** who has specialized in motor applications in the marine field, has been transferred to the company's staff in its Philadelphia office.

J. M. Read, of New Bedford, Mass., has been named a director of Revere Copper and Brass, Inc.

Chain Belt Co. has announced the election of **J. C. Merwin** to the office of treasurer in addition to that of vice-president, which he now holds, and the appointment of **L. B. McKnight** as assistant to the vice-president.

The National Association of Manufacturers has announced the appointment of **J. C. Gebhart** as its director of research. Mr. Gebhart since 1936 has been executive director of the National Economy League.

C. D. Macpherson, of the Hoist and Body division of Gar Wood Industries, Inc., was reappointed a member of the board of directors and also continues on the executive committee of the manufacturers' division of the American Road Builders Association.

C. L. Barnes, chairman of the board of Houdaille-Hershey Corp., is resigning from that position, effective March 31. After 45 years in active business, Mr. Barnes is retiring to rest and recuperate his health. He will remain on the board of directors.

E. T. Weir, chairman of the board, National Steel Corp., and president of

the American Iron and Steel Institute, has been appointed chairman of the Republican National Finance Commitee.

Timken Roller Bearing Co. announces the appointment of **W. H. Richardson** to the newly created post of assistant general sales manager. **E. H. Austin** succeeds Mr. Richardson as general manager of the service-sales division. **R. P. Proffitt** has been appointed Chicago division manager of the company.

New Warranty for Cummins Diesels

A new warranty policy is announced this month by Cummins Engine Co. The warranty became effective March 1. Under its terms, the company guarantees its Diesel engines 100,000 miles or one year.

The warranty states in part that Cummins Diesels ". . . . are warranted to be free from any defects in workmanship and material under normal use and service . . . within the first twelve months or the first 100,000 miles of operation, whichever shall first occur, from date of delivery of the engine to the original purchaser."

RMA Report on Casing Shipments

Shipments of automotive casings during January, 1940, are estimated to have been 4,276,512 units. This is 9.8 per cent lower than the 4,740,112 units shipped during December but is 5.4 per cent above shipments for January, 1939, according to statistics released by The Rubber Manufacturers Association, Inc.

Replacement shipments totaled 2,382,826 units in January. This is 18.8 per cent above the December replacements of 2,006,188 units and 5.2 per cent above replacement shipments for January, 1939, which were 2,265,353 units.

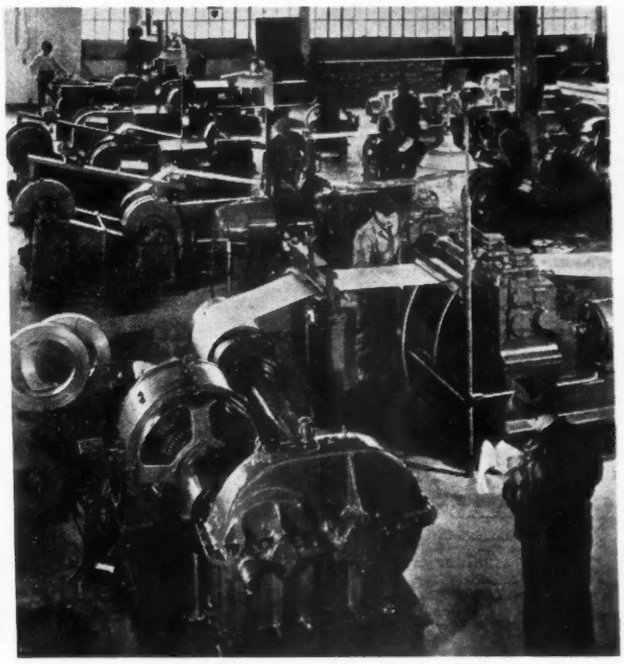
Shipments of casings for original equipment purposes are estimated to have been 1,804,606 units, a decrease of 31.1 per cent under the December figure of 2,618,097 units and 7.0 per cent over January, 1939, when original equipment shipments were 1,686,712 units.

Export shipments are estimated to have been 89,080 units for January which compares with 115,827 units for December and 105,305 units during January, 1939.

January production, estimated at 4,976,548 units, was 11.1 per cent higher than December and 11.5 per cent above January, 1939.

Automotive casings in the hands of manufacturers, January 31 are estimated to have been 9,388,742 units. This represents an increase of 8.1 per cent over December 31 stocks and 5.1 per cent over the January 31, 1939 inventory.

Stainless



The coil trimming and slitting department in Republic Steel Corp.'s improved and greatly expanded stainless steel finishing plant which was formally put into operation at Massillon, Ohio, on Feb. 28. In this department coils are trimmed to exact dimensions and slit into narrow widths for use in automobile molding and hundreds of other applications. The facilities at Massillon, which now occupy all wings of a five-acre building, give Republic a stainless capacity in the strip department alone of 1200 tons per month.

A.M.A.'s Budd Urges Trade Extension

Burton C. Budd, chairman of the Automobile Manufacturers Association export committee, and vice-president of Packard Motors Export Corp., stressed the importance of expanded foreign trade to both the agricultural and industrial segments of the United States economy in a statement before the Senate Finance Committee urging extension of the Reciprocal Trade Agreements Act.

In substantiation of the automobile industry's endorsement of H.J.Res. 407, renewing the Act, Mr. Budd called attention to the increased employment and purchasing power produced here at home by the industry through enlarged output of vehicles for export, the association reported. Noting that between 85 and 90 per cent of the industry's annual sales go to domestic customers, the witness stressed the motor manufacturer's basic concern with the welfare of the home economy. In this connection he noted the allegations sometimes made that trade agreements may harm the American farmer (best customer, he said, of the automobile industry).

"To the contrary," he told the Committee, "we believe that the duty reductions that have been made had no serious effect on the agricultural industry, while increased exports have widened the market for farm products. . . . Agriculture and industry have a common stake in foreign trade."

C. F. Splitdorf

Charles F. Splitdorf, 72, inventor of the Splitdorf magneto, died recently in New York. A son of Henry Splitdorf, who founded the Splitdorf Laboratory in 1858, he expanded this business and established it as the Splitdorf Electric Co. Principal products of this company were the Splitdorf magneto and spark plugs.

The company subsequently merged with the Edison interests. It is now combined with other Edison manufacturing properties in West Orange, N. J.

Estimated Dealer Stocks of New Passenger Cars

1939	January	February	March	April	May	June
Production—U. S. Domestic Market †	262,330	223,795	279,148	257,058	222,909	233,311
Retail Sales—U. S. ‡	180,692	165,865	276,364	265,992	276,719	254,604
Change in Inventory	+81,638	+57,930	+2,784	−8,934	−53,810	−21,293
Inventory, first of month	261,980	343,618	401,548	392,614	338,804	317,511
1939 (continued)	**July**	**August**	**September**	**October**	**November**	**December**
Production—U. S. Domestic Market †	142,346	56,245	155,430	239,150	272,747	357,712
Retail Sales—U. S. ‡	229,873	166,172	139,222	236,584	257,398	274,233
Change in Inventory	−87,527	−109,927	+56,208	+2,566	+15,349	+83,479
Inventory, first of month	229,984	120,057	176,265	178,831	181,397	196,746
1940	**January**	**February**	**March**	**April**	**May**	**June**
Production—U. S. Domestic Market †	348,755	.....	.....	.....	.....	.....
Retail Sales—U. S. ‡	239,506	.....	.....	.....	.....	.....
Change in Inventory	+109,249	.....	.....	.....	.....	.....
Inventory, first of month	280,225	389,474	.....	.....	.....	.....

†—U. S. Census Bureau. ‡—Automobile Manufacturers Association.

AUTOMOTIVE INDUSTRIES

Summary of Automotive Production Activity

BUSES Output continues at good pace with future bright. Manufacturers stimulated by New York City transit consolidation under city ownership which may mean outlet for 500 units.

TRUCKS Both current production and sales estimated 20 per cent greater than same period last year. Prospects of business holding up well for some time are considered encouraging by leading producers.

TRACTORS Production schedules continue strong with many builders reporting output at maximum capacity. Sales also holding up well and future appears decidedly encouraging.

AUTOMOBILES Output for first half of March estimated at 232,000 cars and trucks. This figure may be revised upward if expected improvement in sales is realized. Official AMA estimate for February output set at 421,690 units.

MARINE ENGINES Several producers report they are "uncertain" about immediate future. However, distributors report steady gains over 1939 with prospects more than encouraging for the first half of 1940.

AIRCRAFT ENGINES Despite censorship on production figures, output continues to keep major plants working two and three shifts. Development work continues at record-breaking rates.

This summary is based on confidential information of current actual production rates from leading producers in each field covered. Staff members in Detroit, Chicago, New York and Philadelphia collect the basic information, in all cases from official factory sources.

(Copyright 1940, Chilton Co., Inc.)

Little Change in Steel Prices Expected for Second Quarter

Car Manufacturers and Steel Producers Avoiding Unnecessary Future Commitments

Current steel takings by automobile manufacturers and parts makers temper what would otherwise have been a much more abrupt decline in mill activities, but the slower pace at which tonnage commitments are coming out is reflected in the first marked dip in furnace operations in the Detroit area in weeks. After having operated at 92 per cent of capacity for almost two months, Detroit district plants mustered the week ending March 9 an 85 per cent rate, four open-hearth furnaces having been temporarily withdrawn. On the other hand, word comes from a number of other steel making districts that alloy steel demand is on the upgrade, indicating more active interest on the part of automotive buyers.

Employed ingot capacity for the country as a whole, according to the American Iron & Steel Institute, slipped the week ending March 9 to another low for the year, receding to 64.6 per cent, compared with 65.9 per cent in the previous week. In a few cases, buyers have asked for the postponement of shipments until later in the spring, and this accounts for the moderate decline in the backlogs of some mills.

Better inquiry for both hot-rolled and cold-finished bars is noted. Flat rolled descriptions, both sheets and strip steel, are moving in a routine way. Steel sellers continue to point out that current shipping orders for sheets are billed at the full, publicized prices. Certain it is that much of the talk of a few weeks ago of impending price sensations has died down, and the leading interest's reaffirmation of prevailing prices for the second quarter leaves the market entirely unchanged. For the time being, both automobile manufacturers and steel producers appear to be satisfied with avoiding all unnecessary commitments for the future. A little more semi-finished steel is being sought for export, but even if the nations at war should buy much more heavily in this market than they have in the last six months, the domestic market is unlikely to be in any way affected.

While the tin market is a shade easier than it was under the first impact of the sharp cut in export quotas, tightening of foreign exchange control by the British, which would compel American buyers to make payments for tin in London, and other restrictive measures make the price outlook uncertain. For shipments of tin traced to undesirable ultimate consignees a heavy penalty is to be levied.

News that the French government had bought an additional 75,000 tons of electrolytic copper at the reported price of 11½ cents, had little effect on the market here. Most of this metal, if not all, will come from American-owned mines in South America and Africa.—W. C. H.

Houdaille-Hershey Report

Houdaille - Hershey Corp. and its subsidiary companies report for the year ended Dec. 31, 1939, net consolidated profit of $1,487,607.39 after all charges.

Charles B. Shanks

Charles B. Shanks, one of the early pioneers of the automobile industry, died in Deland, Florida, March 3 after a four-days' illness. Leaving his home in Philadelphia two weeks ago, accompanied by his wife, he had driven to the southern resort for the remainder of the winter season. He was stricken on the preceding Wednesday and was taken to Deland Memorial Hospital, where he died.

"Charlie" Shanks, as he was affectionately known to all the oldsters in the automobile industry and trade, was the first newspaper automobile editor in this country, having created that

Charles B. Shanks

position on the *Cleveland Plain Dealer*. As one of the stunts he originated in that job, he rode as an observer with Alexander Winton on the first long-distance tour ever attempted in an automobile in this country—from Cleveland to New York City in 1899.

He then became the automotive industry's first advertising manager—for Winton—and, later, as sales manager for the same company, sold the first fleet of automobiles ever delivered in this country.

He became business manager of *Motor World* (now *Motor World Wholesale*) in 1915, and remained with the Chilton Company, its publishers, almost continuously until 1932. After two years as sales manager of the McCandlish Lithograph Co., Philadelphia, he retired from active business. He is survived by his widow, Nelle Ford Shanks, and their son, William F.

Chrysler Profit Near 40 Million

Net profit of Chrysler Corp. for the year 1939, as indicated in the corporation's report to stockholders, was $36,879,828.75. Net profit in 1938 was $18,798,294; in 1937, $50,729,211.

Ourselves & Government

A Check List of Federal Action Corrected to Mar. 8

NATIONAL LABOR RELATIONS BOARD

Ordered elections "as soon as practicable" among 125,000 to 150,000 employes of 59 plants of General Motors Corp. in 12 states, as result of agreement entered into Feb. 13 between corporation, AFL and CIO. (See story page 294.

Board announced on March 5 that an election would be held within 30 days among all production and maintenance employes, including inspectors, of Federal Screw Works, Detroit, to determine whether they desire to be represented for the purposes of collective bargaining by CIO-UAW, by unit 25 of American Labor League, or by neither. Board also announced dismissal of an unfair labor practice complaint against the company based on charges filed by the Automobile Workers.

Board has announced certification of one CIO and one AFL union as the sole collective bargaining representatives of employes of Borg-Warner Corp., Muncie, Ind., following an election. All employes except those in the pattern department voted 164 to 68 in favor of UAW-CIO. The pattern makers voted 14 to 0 in favor of AFL's Pattern Makers Association of Indianapolis and vicinity.

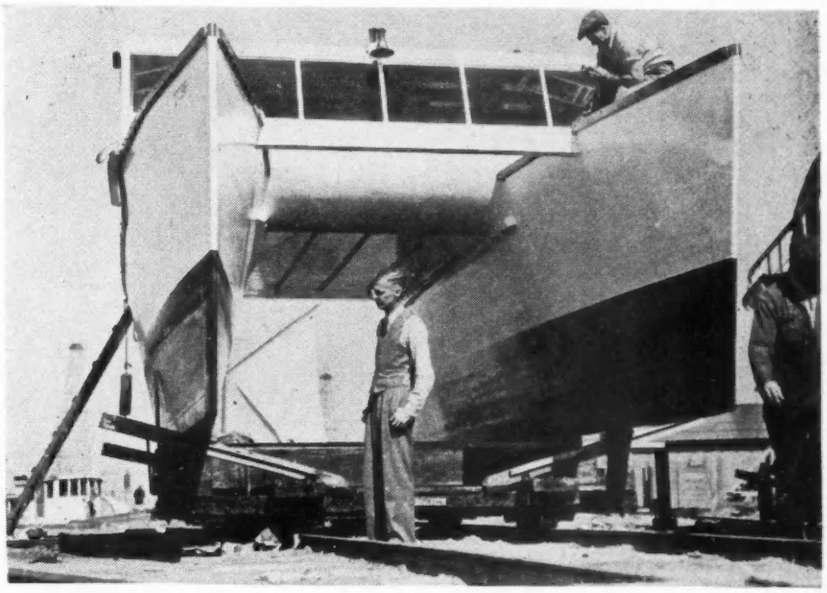
FEDERAL TRADE COMMISSION

F.O.B. PRICE CASE — Trial examiner's report next development expected in the Ford case. Testimony closed in GM case with trial examiner's report, commission's brief and respondent's reply brief all filed.

VS. GENERAL MOTORS—Trial examiner's report due. Case involves FTC charge that GM dealers are required to handle GM parts exclusively.

VS. AUTOMOTIVE TRADE ASSOCIATIONS—Counsel for the FTC and for the respondents are negotiating a stipulation, which if agreed upon will result in the issuance of a cease and desist order or a dismissal. Involved are the National Standard Parts Association, the Motor and Equipment Wholesale Association, both national organizations, and three mid-western regional associations which were charged in October, 1936, in an FTC complaint with allegedly forming a combination to control the market and maintain resale prices.

FAIR TRADE PRACTICE RULES. Hearing on proposed FTC rules called for March 20.



Acme

Siamese

Constructed by E. E. McLary, this novel dual-hulled power boat has just been completed at Long Beach, Cal. The catamaran type cruiser floats on two narrow hulls 47 ft. long, each of which carries a 100 hp. engine. Distance between the two hulls is 10 ft. 3 in., extreme beam is 14 ft. Said to draw only 27 in. of water, the craft carries 20 passengers comfortably.

ADVERTISING

R. E. Johnson, formerly with the west coast office of McCann-Erickson, Inc., has been appointed Pacific Coast representative for Ross Roy, Inc. Mr. Johnson will handle various phases of Dodge truck advertising and publicity on the coast.

J. Albert Laansma, editor of *Motor World Wholesale*, has been placed in charge of advertising in the State of Michigan for the Chilton merchandising magazines—*Automobile Trade Journal*, *Motor Age*, and *Motor World Wholesale*.

F. A. Berend, for six years advertising manager of Pontiac Motor Division, has resigned to take charge of the new West Coast offices being opened by MacManus, John & Adams, Inc. He is succeeded at Pontiac by W. J. Mougey, formerly Chicago zone manager.

Further additions to the staff of MacManus, Johns & Adams include J. H. Sheldon and G. E. Olson. Mr. Sheldon was formerly with Ruthrauff & Ryan. Inc. Mr. Olson has been a commercial artist in Detroit for many years, specializing in automotive art.

Willys advertising in March is being intensified by increased newspaper advertisments and local merchandising. The advertising centers around the new three-year, or 100,000 mile, guarantee and recent economy records.

D. M. Carson has been appointed to the creative staff of Seiler, Wolfe and Associates, Inc., Detroit. Since 1926 Mr. Carson has been with Detroit agencies, working largely on publicity and public relations for automotive accounts.

Critchfield & Co., Chicago, will direct the advertising of Fisk Tire division of the U. S. Rubber Co. The famous "time to retire" trademark will be continued.

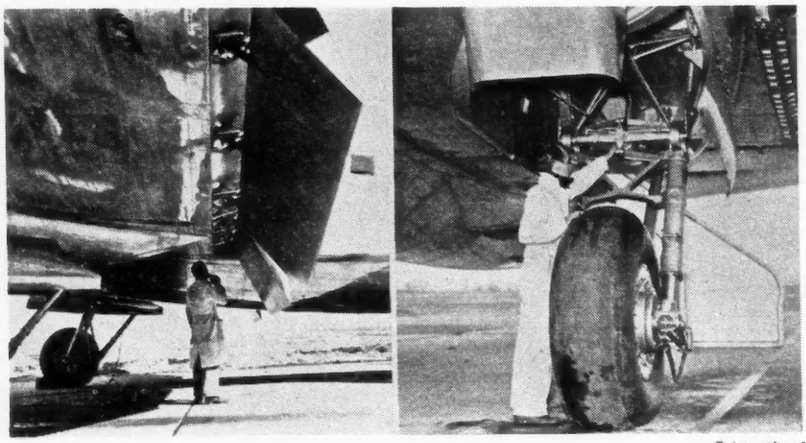
Synthetic rubber division, Chicago Rawhide Mfg. Co., has appointed William L. Diener, Inc., to handle its advertising.

Biggest news in the recent report of Media Records, Inc., is the gain of 57.5 per cent in automotive linage in 52 cities. Other newspaper linage classifications showed little change.

Frank J. Denney, advertising manager of Cadillac, has resigned to join MacManus, John & Adams, Inc., Detroit. In his new capacity he will be assigned to the Cadillac-LaSalle account. Charles Betts, assistant sales promotion manager at Cadillac for the past year, succeeds Mr. Denney. J. W. Eberts will become assistant sales promotion manager.

Sales Increase for Motor Wheel Corp.

Net profit of Motor Wheel Corp. for 1939 has been reported by the company as $1,849,238.95. Gross sales in all lines were said to be 30 per cent greater than in 1938, with the greatest increase being in the automotive division.



International

Flippers and Folders

Two interesting features of the Curtiss-Wright substratosphere transport plane, now undergoing tests at Lambert St. Louis Field, are shown in these pictures. At left can be seen the slotted wing flaps, 4 ft. wide, operated hydraulically, which were especially designed for this plane and which, it is claimed, will reduce the landing speed of the 36-passenger airliner to 65 or 70 m.p.h. At the same time they will increase buoyancy by increasing the wing area. At the right a workman is shown making an adjustment in the retractable landing gear. A housing closes over the retracted wheels in flight.

Graham Plans Early Output of Three New Models in 1940 Line

New Merchandising Plan Lets the Dealer Establish Final Sale Price

Production of Graham cars is anticipated before the end of March as the Graham-Paige Motors Corp. prepares to introduce its 1940 line of models. Under a new financial setup and with a revamped sales force, the company is assembling materials and supplies at its Detroit plant.

August Johnson, the new executive vice-president in charge of sales who came from the Pacific Coast, where he was a Graham distributor, has conceived a new merchandising plan for Graham dealers. Instead of the factory setting a basic price on models, plus delivery charges, the dealer will be allowed to set his own new car prices. Thus the dealer can set a price to meet the particular competitive conditions of his territory.

In announcing the new policy, Johnson said, "An advertised factory delivered price is helpful in establishing a car in the minds of the public as low priced . . . but local conditions vary so much that this same price serves only as a general guide for the dealer. He may cut into his percentage of this price by giving cash discounts and over-allowances."

Finance companies will be advised of the car's price structure and the three new Graham lines will be held within limits defined by the wholesale price of the car to the dealer.

Joseph B. Graham, president, will devote his time to engineering and production problems, turning the sales completely over to Johnson.

The new Graham line will feature three models—the Senior, Hollywood and Clipper. The Senior and Hollywood will feature the supercharger developed by Graham engineers.

An RFC loan of $2,000,000 at 4 per cent to provide working capital has been obtained and is payable starting Aug. 12, 1940, at the rate of $10,000 per month, or 50 per cent of annual net earnings, whichever is higher. The loan maturity is Aug. 12, 1945, and any balance due then will be refinanced. So far, $1,515,285 of the loan has been disbursed, going toward retiring $750,000 due the RFC on its old loan and to increase working capital. The RFC also has set up a revolving fund of $500,000 against which short term loans can be obtained by pledging finished cars and receivables.

An additional $300,000 has been obtained by the sale of convertible notes to officers and directors. These notes are convertible into common stock at one dollar per share, cary a 5 per cent interest rate and mature in five years. The notes, along with $90,295 in deferred liabilities, are subordinate to $839,500 6 per cent first mortgage bonds and the RFC second mortgage.

Additional funds to the sum of $150,000 also have been obtained from private sources to finance completion of tools and dies for the new models.

Under the five-year extension of accounts made in 1938, over 98 per cent of the creditors have accepted the offer of President Graham to purchase these claims at 10 per cent of their face value, 5 per cent in cash and 5 per cent in common stock at the stated value of $2.50 per share. The claims have been turned over to the company in exchange for 5 per cent five-year notes maturing Aug. 12, 1945, and convertible into common stock at one dollar per share.

Net loss for 1939 was $1,241,046 compared to a loss of $1,920,186 in 1938. The company's balance sheet as of Dec. 31, 1939, shows cash of $783,838.45, current assets of $1,252,058.06, and current liabilities of $454,498.12, a ratio of 2.75 to 1.

District sales heads appointed by Johnson under the new sales plan are: D. N. Larson, Chicago; Lee Schwarts, Detroit; Joe Brancherry, New England; John Williams, Minneapolis; E. V. Normoyle, Philadelphia; Nelson Beardsley, New York; T. H. Barton, Ontario and Quebec; George Clark, Indianapolis; Walter Allee, Pacific Northwest; John Nichols, South Atlantic States; A. Montgomery, Southwest States; Reynold Johnson, California.

Graham's plans for manufacturing the body, chassis and parts for the Hupmobile Skylark models are dependent upon the ability of the Hupp Motor Car Corp. to successfully negotiate its financial problems. The Detroit Common Council recently denied a hearing to Hupp for a reduction of its 1939 taxes. Hupp maintained that its personal property assessment of $1,000,000 for 1939 was unjust.

Dealer Referendum

(*Continued from page* 293)

and unscrupulous fellows who will find it profitable to operate outside the law while you and all other law-abiding dealers maintain a cover for their operations during the brief period of our illusionment.

Brief in Favor of the Bill

1. VOLUME VS. PROFIT. There is an irreconcilable conflict between manufacturers and dealers that they will never voluntarily solve; the desire for greater volume of sales by the manufacturer as against the desire for profitable sales by the dealer.

2. FORCING THE MARKET. The manufacturer's profits depend primarily on volume. When that volume exceeds the normal demand, an artificial market is created by lowering prices—but the manufacturer forces the dealers to stand the whole loss through over-allowances.

3. MANUFACTURERS DICTATORS. The manufacturer is under no legal obligation to a dealer and forces him to sell more cars—even at a loss—under threat of cancellation. Being under no legal obligation the manufacturer need exercise little care in ap-

pointing dealers, so unethical dealers are deliberately placed in direct competition with you.

4. CHECK MANUFACTURERS. Manufacturers must be forced to recognize the dealer's interest. The Federal Government is the only agency strong enough and the Federal Trade Commission is the best equipped department to exercise the necessary supervision.

5. CONFERENCE TABLE. The conference table method should be used, but this one irreconcilable conflict will not be solved there.

6. MUST RECOGNIZE DEALERS. This Bill provides for a minimum three-year contract. This Bill is not the whole answer but it seeks to do the one thing dealers can not otherwise do—force the manufacturers to recognize the dealer's right to run his own business.

7. BUY OUT ON CANCELLATION. If, however, the manufacturer wishes to continue to exercise his control over the dealer's operations, then under this Bill he must assume the responsibility of buying out the dealer at fair prices if he arbitrarily cancels the contract.

"Round" Type Engine Has Flight Tests

A new barrel-type engine with which National Motor Corp. has been experimenting recently had a brief flight test while mounted on a light plane. Responsible for the original design of the engine is Lee Oldfield, now with Schwitzer-Cummins Co., who worked with it over a period of 16 years, ceasing to work on it three years ago when he licensed National Motor Corp. to continue its development. The development of the rights to the use of the design for other than aircraft purposes is controlled by E. S. Hall.

Details of the engine's construction are not available at present. It is of 50 hp. with wobble-plate mechanism and cylinders parallel to the shaft. It is liquid cooled and operates on the two-cycle principle.

In a letter to AUTOMOTIVE INDUSTRIES, Mr. Oldfield stated, "It seems to be a fact beyond any reasonable question that round engine designs of whatever type of conversion mechanism require very much less 'lazy' material than do any other designs; the result being that as the engines go up in displacement they go down in specific weight, and very light engines can be built when the displacement is correct. Crankless engines have been known since 1880, possibly earlier, but it is believed that this design represents the first one to be actually built in which the mechanical efficiency of the conversion mechanism is definitely as good as that of a good crank mechanism designed to do the same amount of work."

Fire Horse

The British Scammell three-wheeled truck tractor, known as the "mechanical horse," is shown fitted up as a fire fighter for service in a steel manufacturing plant. With a wheelbase of 97 in., it has a turning radius of less than 12 ft.

PUBLICATIONS

Thirty-five procedures for **stabilizing employment** in industry are analyzed in a survey report made public by the National Association of Manufacturers. The report also contains a compilation of 68 case histories of individual companies which present in detail experiences with employment stabilization. Copies of the report may be obtained for 15 cents from the association, address 14 W. 49th St., New York City.

Four new folders have been published by General Electric Co. No. GEA-1184D describes an A-C **magnetic motor starting switch** for squirrel-cage motors or as primary switch for wound-rotor motors. No. GEA-3301 describes the G-E Reactrol System for **controlling electrically heated equipment.** No. GEA-3337 announces the G-E **series-capacitor equipment for welding-machine applications.** No. GEA-2915A describes the type KC (⅛ to ¾ hp.) **general purpose capacitor motors.***

The February issue of "Flashes," published by Thomson-Gibb Electric Welding Co., contains information on the new Thomson **tubular secondary transformer.***

A recent bulletin by Worthington Pump and Machinery Corp. describes the company's balanced-angle, two-cylinder **air compressors.** Three other single page bulletins describe the Rock Master **wagon drill,** a new **portable compressor,** and the No. 180 **pneumatic-feed drifter.***

A second and revised edition of the book **"Rubber and Railways"** has been published by the British Rubber Publicity Association.*

A booklet, showing the mechanical features and capacities of its "12" series of **motor graders,** has been published by Caterpillar Tractor Co.*

A folder has been prepared by Chrysler Corp. entitled **"The Chrysler Industrial Association—How It Works".***

Abrasive Engineering Corp. has **released** a booklet on its new type "P" portable Grade-O-Meter for the correct **grading of grinding wheels.***

A booklet, containing data and information on the development of its **Diesel engines,** has been published by Cummins Engine Co.*

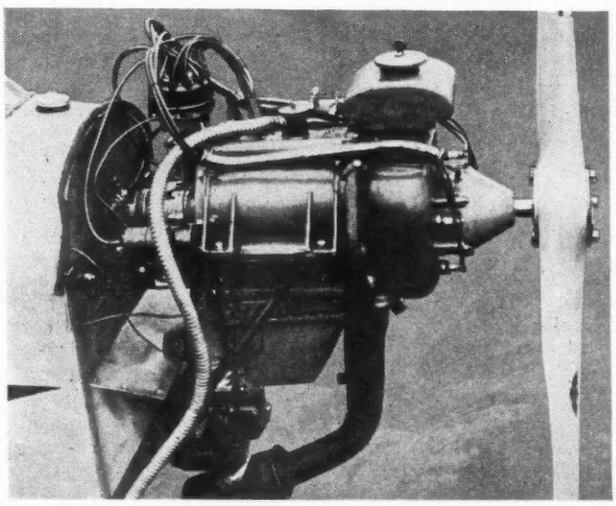
Flexrock Co. has published a folder giving information on its Concretdense water, oil and light acid resistant **flooring material.***

Bulletins have been **released** by Caterpillar Tractor Co. dealing with its new 66-kilowatt and 52-kilowatt **Diesel electric sets.***

No. 35 in the series of booklets being published by Farrel-Birmingham Co. is called "A Needed Curb on Federal Administrative Law"; it discusses the Logan Bill.*

A new six-page illustrated folder, issued by Westinghouse Electric and Manufacturing Co., gives details of the die hardening **electric furnace** with ammogas atmosphere for bright hardening of dies and tool steel.*

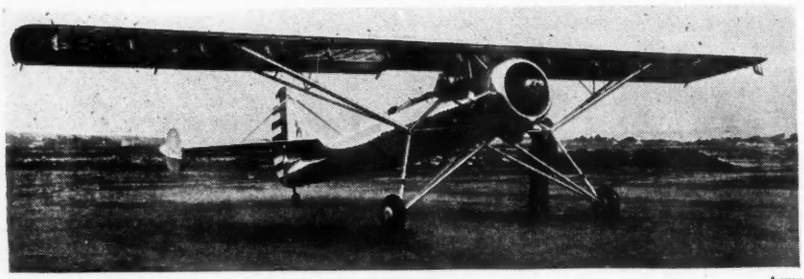
The National Bureau of Standards has completed a condensed record of the recent general conference on **lamps and signal equipment** for motor vehicles (after market). A limited number of copies is available.*



"Round" Engine

The new National Motor Corp. engine as it was mounted on a light plane for flight tests.

* Obtainable through editorial department, AUTOMOTIVE INDUSTRIES. Address Chestnut and 56th Sts., Philadelphia. Please give date of issue in which literature was listed.



Acme

Flying Motorcycle

. . . thus was dubbed this new Ryan observation plane built for the U. S. Army. It is said to be the first plane designed especially to fit the needs of the Infantry, not only to cooperate with the infantry itself, but also to adjust artillery fire. It is a short-range, highly maneuverable, short landing, quick take-off type, and is adaptable for use as a liaison agent for ground commanders.

Australia to Boost Aircraft Production

A report from the American Trade Commissioner, Sydney, Australia, to the Department of Commerce indicates that airplane production may be speeded in that country. A bill introduced into the Federal House of Representatives would, if passed, give the government power to purchase factories for the manufacture of aircraft and parts. There is authority to establish factories, but the time factor is important and it is said existing facilities will have to be taken for the purpose. It was stated officially that 8000 to 10,000 men would be engaged by the end of 1940 in producing one type of bomber and certain other aircraft.

Sections of the state railway workshops at Victoria, New South Wales and South Australia have been converted to produce aircraft parts and construction of main assembly plants has begun.

In addition to the manufacture of high-powered radial engines, decision has been made to produce DeHavilland "Gypsy" four and six cylinder engines for training planes.

DeWitt Page

DeWitt Page, 70, died suddenly recently at Hialeah Park, Fla. Mr. Page was formerly president and general manager of New Departure, and a director and vice-president of General Motors Corp.

Germany's Car Exports Reported at High Level

Dispatches to the Commerce Department indicate that Germany has been able to maintain a high level of motor vehicle exports to southeastern European countries since the outbreak of war. German manufacturers, the report said, have large stocks on hand because of the curtailment of private motoring in Germany. The claim is made that manufacturers have adequate supplies of raw materials available for production.

Figures on hand at the Commerce Department show that during the first seven months of 1939, Germany exported 50,657 automobiles and trucks. Sweden, the largest outlet for German automobiles, took 14,150 units. Denmark, Hungary, Belgium, Norway and the Netherlands were next in line in the order named. Prices of German motor vehicles have not changed materially since the war, the report said.

GM Ballots

(*Continued from page* 294)

die sinkers are: Cadillac motor car division, Detroit; Buick motor division, Flint; two plants of the Chevrolet motor division, Flint and Saginaw, Mich., two plants of Fisher Body division, Detroit; Pontiac motor division, Pontiac, Mich.; Saginaw malleable division, Saginaw, Mich.; Research Laboratories division, Detroit; and one plant in Ohio, Cleveland Diesel Engine division, Cleveland.

The remaining plants are: AC Spark Plug division, Flint; 17 plants of the Chevrolet motor division, Norwood and Toledo, Ohio—Janesville, Wis.—North Tarrytown, New York — Atlanta — Muncie, Ind.—Baltimore—Kansas City and St. Louis—Buffalo—Detroit, Hamtramck, Saginaw and Bay City, Mich.; two plants of the Delco-Remy division, Anderson and Muncie, Ind., 20 plants of the Fisher Body division, Flint, Detroit, Lansing and Pontiac, Mich.—Atlanta—Baltimore—Kansas City and St. Louis—Buffalo and North Tarrytown, N. Y.—Cleveland and Norwood, Ohio—Janesville; Guide Lamp division, Anderson, two plants of Harrison radiator division, St. Louis, and Lockport, N. Y.; Linden division, Linden, N. J.; two plants of New Departure division, Bristol and Meriden, Conn.; Olds Motor Works division, Lansing; Saginaw Steering Gear division, Saginaw; Southern California division, South Gate, Cal.; Styling section, Detroit, and Ternstedt Mfg. division, Detroit.

CENSORED

An exclusive feature prepared by the London correspondent of* AUTOMOTIVE INDUSTRIES, *M. W. Bourdon.

Following negotiations among British passenger car makers, a general increase in prices has taken place in respect of cars still being produced for sale to the public. Ford led the way early in the New Year and has been followed by Vauxhall, Riley, Wolseley and Standard, among others. The average increase is around 10 per cent.

* * *

According to the latest figures issued by the Ministry of Transport covering registrations up to the end of December, the sale of new cars in Britain fell by 77.3 per cent during the first four months of the war compared with the corresponding months of 1938. The great majority of the 18,057 cars sold during the four months were low-powered models. Thus, in December out of 4668 (against 26,018 in Dec. '38) only 219 were of more than 15 hp. rating; and 70 per cent of the remainder were of 10 hp. or less.

* * *

Morris has introduced two new models in the form of light delivery vans with steel-panelled bodies. They are for useful loads of 550 lb. and 1100 lb. respectively. The smaller one has its 8 hp. engine considerably offset from the center of the chassis to give room for the pedals to be located alongside it, so that the driver can have a "semi-forward" position. This arrangement, on a wheelbase of 89 in. and 48 in. track, allows a body with a load space of 79 cu. ft. to be provided. On the larger chassis, with a 12 hp. offset engine, a wheelbase of 90 in. and a 54 in. track, the load space is 119 cu. ft. Prices of these vans, unpainted, are £127 and £175. An alternative body on the 12 hp. chassis is an open truck.

* * *

The London *Times* reports that in spite of war and the enforced disuse of cars, German is continuing to expand her network of motor roads. Immediately after the conquest of Poland, it is stated, a beginning was made with an extension of the Berlin-Stettin autobahn through Pomerania and the Polish Corridor to Danzig, whence connection is made, via Elbing, with the autobahn to Konigsberg at a point some eight miles south of Danzig. Whether the plans to continue this road from Konigsberg to the Baltic States will remain unchanged is considered a point of doubt in view of the recent extension of Russian influence.

Improvement

Pointing up the fact that the automobile industry makes more rapid strides every year than is generally credited to it by the public, the De Soto division of Chrysler Corp. has launched a new campaign to show the difference between its 1940 models and recent model cars only two, three or four years old.

Addressed directly to "The Eight Million People Who Own 1936, 1937 or 1938 Cars," the company's messages, available in the form of a "Buyer's Guide" at De Soto showrooms, state that the new De Soto has at least 39 vital new features which these older cars do not have.

Said L. G. Peed, vice-president in charge of sales, "Giving the public this new slant on the progressiveness of the automobile industry will, we believe, help to eliminate the almost universal feeling that you have to look back 10 or 15 years to get a perspective of the improvements in automobiles. Anyone who has the impression that engineers have merely added refinements and gadgets since 1936 will be surprised at the long list of important developments."

P. C. Sauerbrey

P. C. Sauerbrey, first vice-president and general manager of Plymouth Motor Corp. died recently in Fort Lauderdale, Fla. He had been active in the automotive industry since 1906 when he was employed as a machinist for the Palmer-Singer Automobile Co. Mr. Sauerbrey became vice-president in charge of manufacturing for Plymouth in 1929.

CALENDAR

Conventions and Meetings

SAE National Transportation & Maintenance Meeting. Pittsburgh.Mar. 28-29
International Acetylene Association, Convention, Milwaukee, Wis., April 10-12
Chamber of Commerce of the United States, Annual Convention, Washington, D. C. .....April 29-May 2
American Society of Mechanical Engineers, Spring Meeting, Worcester, Mass. .....May 1-3
SAE National Production Meeting, Hartford, Conn. .....May 7-8
SAE Summer Meeting, White Sulphur Springs, W. Va. .....June 9-14
American Society for Testing Materials, Annual Convention, Atlantic City, N. J. .....June 24-28

Shows at Home and Abroad

National Automobile Show, Grand Central Palace, New York.....Oct. 12-19
National Metal Congress & Exposition, Cleveland, O. .....Oct. 21-25

Begin Space Selection For Metal Exposition

Floor plans for the 1940 National Metal Congress and Exposition have been mailed to previous exhibitors in the shows, with requests for space selections. The Exposition will be held in Cleveland from Oct. 21-25 in that city's public auditorium. The National Metal Congress is held simultaneously during the five days with the National Metal Exposition, and participated in by the American Society for Metals, the American Welding Society, The Wire Association, and the Iron and Steel Division and the Institute of Metals Division of the American Institute of Mining and Metallurgical Engineers.

Cadillac-LaSalle Adds New Models

Four new convertible models have been added by Cadillac-LaSalle to its 1940 line. A convertible coupe and sedan are being built in both the LaSalle Special series and in the Cadillac Sixty-two series. Standard equipment includes a power-actuated top.

THE above operation shows a Continental expert inspecting involute curves for correct tooth form. This operation also gives an absolute check on accuracy of hob and machine set-up. Tooth indexing is checked to within .0001.

The machine at left is used in checking the helix angle lead to within .0001 of an inch, and checks eccentricity and size to less than .001 tolerance.

These close tolerances enable Continental Motors Corporation to fit gears with not more than .001 backlash, insuring long life and exceptional quietness.

Painstaking inspection follows each operation. That is why Continental's famous Red Seal Engines excel in performance, economy and dependability.

Continental Motors Corporation
MUSKEGON, MICHIGAN

BOOKS . . . .

Statistical Thermodynamics, by R. H. Fowler, M.A., F.R.S., and E. A. Guggenheim, M.A. D.Sc. Cambridge: At the University Press; New York; The Macmillan Company.

This is a book for advanced students of physics and chemistry and is offered as a link between pure themodynamics and pure statistical mechanics, on which latter subject there is an earlier volume by Professor Fowler. It is pointed out in the preface that the kinetic theory of gases, developed by Clausius, Maxwell and Boltzmann, has since been expanded so greatly that the name is no longer adequate, and the descendent theory may be called "the atomic theory of the properties of matter in bulk." In this theory the properties of matter are treated from the atomic standpoint and derived from atomic properties and the atomic constitution of matter.

Classical thermodynamics considers effect of a certain quantity of heat on a unit mass or mol of matter, usually in the gaseous state. In the new "atomic theory of the properties of matter in bulk" the matter is referred to as "an assembly of electrons, protons, and neutrons" or as "an assembly" for short. The thermodynamic functions for such assemblies and for various phases in which the matter may exist are determined by the application to particular molecular models of the fundamental theorems of statistical mechanics. The prospective reader therefore should first familiarize himself with these theorems. This method imposes certain limitations on substances or phases, which must not be too complicated. This is claimed to be the first extensive exposition making full use of all available *a priori* evaulations of thermodynamic functions, although the employment of these evaluations has become increasingly frequent and successful. The following list of chapter heads may serve to give a more definite conception of the ground covered by the book: General Theorems for Assemblies of Permanent Systems, Permanent Perfect Gases, Crystals, Chemical Kinetics, Lattice Imperfec-Grand Partition Functions and Their Application, Imperfect Gases, Liquids and Solutions of Non-Electrolytes, Solutions of Electrolytes, Surface Layers, Elementary Electron Theory of Metals, Chemical Kinetics, Lattice Imperfections, Electric and Magnetic Properties. The price of the volume is $9.50.

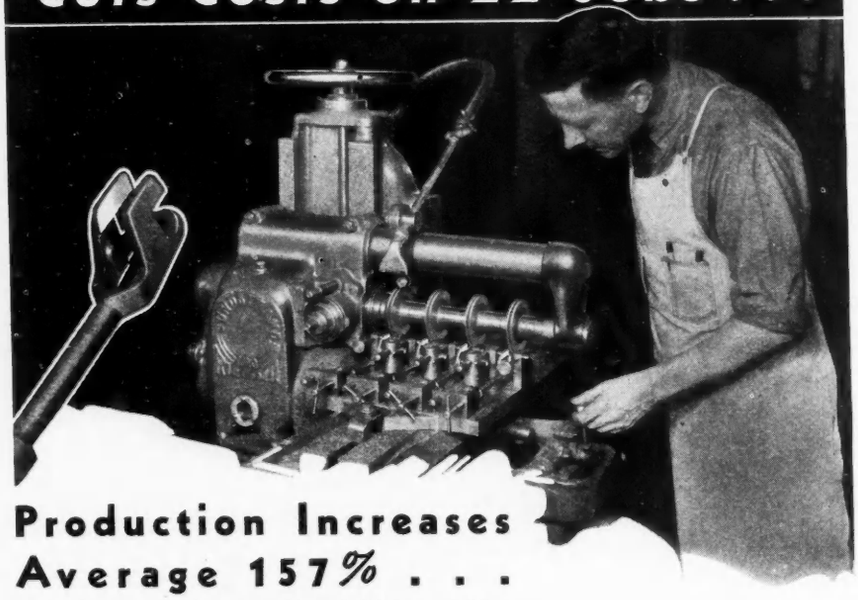
Patent Fundamentals, by Adelbert Schapp of Schapp and Cole, Patent Attorneys, San Francisco, Cal. Published by The Industrial Press, 148 Lafayette Street, New York, N. Y.

This is a book intended for inventors, students and executives and explains the principles of patentable inventions, the procedure followed in securing patent protection, and the drawing up of the necessary documents when making assignments of patents or issuing licenses under them. Essential facts concerning trade marks and copyrights also are included in the volume. The book is written in a very readable style. One of its commendable features is that general statements which often would be somewhat difficult to grasp by the laymen are usually illustrated by examples from actual patent cases. The subject of claims is dealt with in four chapters, with the following chapter heads: "Making Patent Claims Cover Essential Principles," "Types of Patent Claims and Chemical Patent Problems," "Preparing Application and Developing Claims," and "Examiner Checks Claims Against other Inventions." In these much light is thrown on the difficult art of claim writing.

On the Geometry of Optical Indicators, by Kalman J. DeJuhasz, Professor of Engineering Research, The Pennsylvania State College. Published by the Franklin Institute, Philadelphia, Pa. (as a reprint from its Journal).

In this pamphlet Professor DeJuhasz discusses the principles of the optical lever as applied not only to engine indicators but to all sorts of measuring instruments. The advantages of the optical lever in indicating and record-

Sundstrand Rigidmil
Cuts Costs on 22 Jobs . . .



Production Increases Average 157% . . .

The Sundstrand No. 0 Rigidmil illustrated has four pairs of 4" diameter face-mills for machining inside surfaces of extensions on cast iron shafts. After loading the fixture, operator merely tilts his hand to start automatic operating cycle of rapid approach, feed, dwell if desired, quick return, and stop. Net production on this operation averages 140 pieces milled every hour.

It is so easy to set up, and to establish any one of many automatic operating cycles, that this Rigidmil is used for 21 other milling operations. The very large number of spindle-speeds available, infinite adjustment of hydraulic feeds, and high-speed automatic rapid traverses, all combine to increase production an average of 157% on this work, to improve accuracy and finish, to cut costs throughout.

On work similar to that shown above, or different; smaller or larger; Rigidmils can produce big profits for their purchasers . . . and on relatively small investment. Investigate. Consult our Engineered Production experts, *today.*

Features, advantages, cycles, and other important information about Sundstrand Rigidmils is contained in Bulletins 382 and 383 shown above. Write, today, for your copies.

Sundstrand Machine Tool Co.
2527 Eleventh St., Rockford, Illinois, U. S. A.

RIGIDMILS-STUB LATHES
Tool Grinders - Drilling & Centering Machines
Hydraulic Operating Equipment - Special Machinery

ing instruments are its low inertia, the possibility of achieving large ratios of magnification in a single step, and the small backlash and friction. First the optical lever is discussed in a general way, while in the latter part of the treatment its application to various types of instrument is dealt with . . .

Germany Develops New Light Plane

According to a report received by the Department of Commerce, a new light plane has been developed in Germany. The plane, a twin-engined cabin model, was manufactured by the Gothaer Railway Car factory at Gotha and is designated as the "Go150"; it is said to be the smallest twin-engined plane in the world. It is powered by two 50-hp. Zundapp engines. Designed for private use, the plane is said to fly an average of 62 miles on 3.43 gallons of gasoline at a cruising speed of 115 m.p.h.

M.E.M.A. Group Changes Name

The Motor and Equipment Manufacturers Association Light and Signal Group has announced both change of name and of address. New name is Safety Equipment Manufacturers Association; new address, established March 1, is 350 Madison Ave., New York City.

Stinson Moves To Tennessee

On April 1 the Stinson Aircraft division of Aviation Manufacturing Corp. will transfer its principal operations to a plant nearing completion at Nashville, Tenn. Continued operation of the present plant at Wayne, Mich., will depend on the pressure of orders, the company stated. It is planned to take about 200 of the key men to Nashville. Certain shop men will be included along with executive and engineering personnel.

Commercial Credit Reports on Income

Net income from operations of the Commercial Credit Co. for 1939 was stated in the company report to stockholders to be $7,919,994.04. In 1938 net income from operations was reported as $8,998,080.09.

Greece Revises Import Quotas

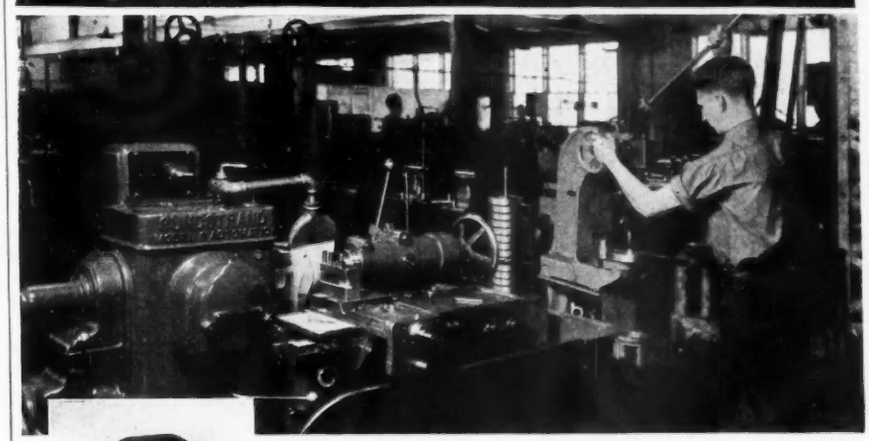
A Greek ministerial decision, effective immediately, establishes a world-wide import quota for passenger cars of 7,600,000 paper drachmas (approximately $54,000) for the first half of 1940, which is equivalent to one-half of the preceding semi-annual quota, according to a cablegram received by the Department of Commerce from the American Legation, Greece. The United States is to receive extra quotas equivalent to any extra quota allotments made to third countries.

Authorized distributors are permitted to import and maintain a permanent revolving stock of motor truck and bus chassis, allocated by makes on the basis of 1938-1939 registrations, which will amount to about 125 American and 40 European units. The stocks are to be replenished, as sales are made within the limits of operating licenses issued by the Ministry of Railways.

Less Work

On its proving ground, Pontiac recently conducted tests to determine just how much easier it is for a motorist to drive a 1940 model car than a 1929 model. The Pontiac engineers found that the driver of a 1940 model car uses 7533 less foot pounds of energy on a 200-mile trip than did the 1929 driver over the same distance. Greatest energy saving came from steering, the results showed; next was braking, followed by clutch pedal effort and gear shifting.

Automatic Stub Lathe
Improves Gear-Blank Production



Turns 17 Types, 850 Sizes Uses Tungsten Carbide Holds Close Limits

The Sundstrand Automatic Stub Lathe shown above runs continually on finish-turning gear blanks, handling 17 types and 850 sizes. It uses tungsten carbide tools effectively; turns diameters, faces both sides and chamfers, all in one operation. Maximum production is secured, limits on diameters and run-out are held within .001". Automatic cycle includes rapid approach, feed, dwell, tool-relief, quick return, and stop. Operator changes work-pieces on arbors while machining is in progress. The Automatic Stub Lathe is so easily set up and changed over that small lots of about 20 pieces each can be finished economically, and costs are cut proportionately on larger quantities.

Compared to methods formerly used, this Automatic Stub Lathe increases production, holds closer limits, improves finish, cuts costs, conserves capital, saves labor and floor space. Other installations handle more complicated operations with equal ease, effect similar savings on a vast variety of work pieces. Look into the advantages of Automatic Stub Lathes for your turning.

Get Data and Estimates
Bulletin illustrated contains complete information on features, advantages, cycles, and specifications. Write for your copy, *today*. Ask for Bulletin 391. For reliable estimates on manufacturing turning operations, send drawings and data to our Engineered Production Department.

Sundstrand Machine Tool Co.
2527 Eleventh Street, Rockford, Illinois

RIGIDMILS-STUB LATHES
Tool Grinders - Drilling & Centering Machines
Hydraulic Operating Equipment - Special Machinery

Testing Equipment Feeds Progress

(*Continued from page* 273)

other sources in an automobile. However, noise is only one of the problems. In addition to operating relatively quietly, the fan must be so fashioned as to produce the maximum cooling effect within the limitations of space, location, and speed.

The final criterion of fan design, and one not obvious to the eye, is that of fine balance, since even a slight degree of unbalance becomes magnified at the high rotational speeds in vogue today. At Hayes, in the final operation, each fan is balanced to ⅛ oz-in.

Research engineers will be interested to learn that the work of this laboratory has demonstrated beyond doubt that the most effective means of reducing the fan-noise level is by driving at much lower speeds. Moreover, a fan of relatively large diameter, running at moderate speed, will increase the cooling effect quite materially, with less power consumption.

Initial laboratory studies make it possible to recheck fan design, by installation in an experimental car and analyzing the noise pattern under actual operating conditions. This provides a means of further refinement before the fan is released for production.

The same instrumentation is employed in the development or testing of mufflers. Here it is a relatively simple matter to record and analyze the primary frequencies due to engine firing, and to separate important harmonics, usually the second and third series. Again, the experimental set-up can be checked and revised by conducting similar studies in an experimental car.

Noise studies are by no means the sole criteria of muffler performance. Hayes engineers may be credited with much of the valuable research in muffler failures due to corrosion and high temperature effects. One of their most recent contributions is the adoption of lead-coated stock which promises to increase muffler life considerably. In this field of investigation, they are constantly studying the effectiveness of other kinds of surface treatments, and they find that the only bar to increased life is the added cost of improved materials.

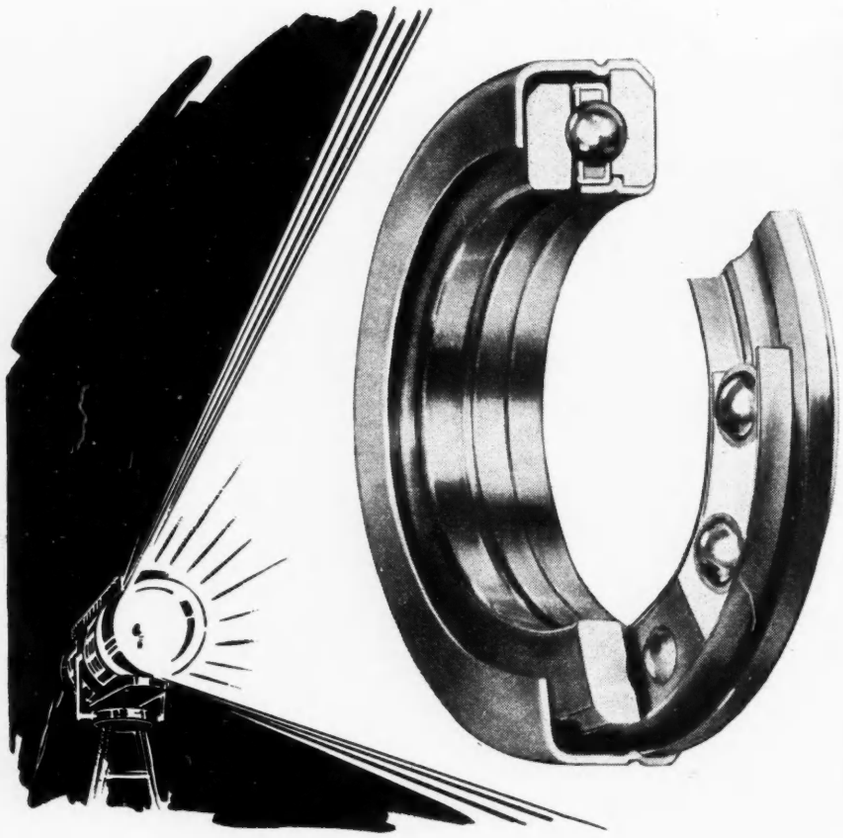
We reproduce herewith illustrations of the sound chamber, the fan wind tunnel and dynamometer, and the muffler laboratory. The illustrations also show the arrangement of the instrumentation described earlier. Finally, there are shown sound-analysis records from fans of several types, as well as an analysis record of muffler noise.

Labor Standards Act Relaxes Requirement

The requirement under the Fair Labor Standards Act that employment records of manufacturers with operations in more than one state be maintained in each state has been relaxed by the wage-hour administrator to permit the keeping of records at a central accounting office.

Requests that records be maintained at a central point have been approved by the wage-hour division on several occasions but in each instance it required express authorization from the administrator. Under the relaxed regulations, additional "abbreviated records" are required at each place of employment but these merely have to show an employe's name, address, occupation, total hours worked and total wages paid.

The wage-hour division indicated that the change will coincide with existing business practices, and suggested that the abbreviated records "could easily be kept in a small book and kept current with little difficulty."



Spot-Lighted Now

TO BE FORGOTTEN LATER

Manufacturers and designers tend to remember and study only troublesome details. BCA Prelubricated Clutch Bearings have been installed and forgotten in many 1940 cars.

Designers of these cars have eliminated costly lubrication lines to service the clutch bearing and the hazards of irregular manual attention.

More important: Customers dissatisfaction caused by annoying squeaks and chirps in clutch operation is a thing of the past on BCA equipped cars. BEARINGS COMPANY OF AMERICA, LANCASTER, PA.

BCA RADIAL • ANGULAR CONTACT • THRUST **BALL BEARINGS**